

History of the Bureau of Engraving and Printing, 1862-1962.

United States.

Washington D. C., : U.S. Govt. Print. Off. [1964?]

<http://hdl.handle.net/2027/mdp.39015016922513>

HathiTrust



www.hathitrust.org

Public Domain, Google-digitized

http://www.hathitrust.org/access_use#pd-google

We have determined this work to be in the public domain, meaning that it is not subject to copyright. Users are free to copy, use, and redistribute the work in part or in whole. It is possible that current copyright holders, heirs or the estate of the authors of individual portions of the work, such as illustrations or photographs, assert copyrights over these portions. Depending on the nature of subsequent use that is made, additional rights may need to be obtained independently of anything we can address. The digital images and OCR of this work were produced by Google, Inc. (indicated by a watermark on each page in the PageTurner). Google requests that the images and OCR not be re-hosted, redistributed or used commercially. The images are provided for educational, scholarly, non-commercial purposes.

A PLAN,

FOR ESTABLISHING, BY ACT OF CONGRESS, NOT A COIN
MINT, FOR THERE IS ONE ALREADY, BUT A

GENERAL PRINT MINT

AT WASHINGTON FOR THE EMISSION OF PAPER MONEY TO
THE AMOUNT PERHAPS OF

TWO HUNDRED MILLIONS,

TO BE FOUNDED UPON A ROCK, AND UPON A CREDIT OF TEN YEARS AT 6 PER CENT.,
WHICH WILL BE PRODUCTIVE OF A RISE OF PROPERTY IMMEDIATELY OF
10, 15, PERHAPS 20 PER CENT., AND, PERHAPS MORE.

BY JOHN H. SARGENT, ESQ.
ATTORNEY & COUNSELLOR OF LAW.

CHARLESTON:

PRINTED BY EDWARD C. COUNCELL,

NO. 1, QUEEN STREET

1837.

Title page of an early pamphlet in the collection of the Library of Congress proposing a "General Print Mint" for the United States. The author shipped a quantity of his treatise to the Postmaster General at Washington requesting that official to distribute the copies to the Members of Congress.

U.S. Bureau of Engraving and Printing.

HISTORY **of the** **BUREAU of ENGRAVING** **and PRINTING**



1862-1962

TREASURY DEPARTMENT
Washington, D.C.

For sale by the Superintendent of Documents, U.S. Government Printing Office
Washington, D.C. 20402. Price \$7.00

HG-
573
A-42
1854

CENTENNIAL HISTORY STAFF

MICHAEL L. PLANT

Office of the Controller

ARTHUR BARON

Office of
Currency and Stamp Manufacturing

LOUISE S. BROWN

Office of Plant
Facilities and Industrial Procurement

JOHN J. DRISCOLL

Internal Audit Staff

MICHAEL J. EVANS

Internal Audit Staff

The Introduction, giving a brief history of the art of engraving and its application in American colonial and early Federal days, was prepared by Robert L. Miller of the Bureau's Designing Staff, Office of Engraving and Plate Manufacturing.

Foreword

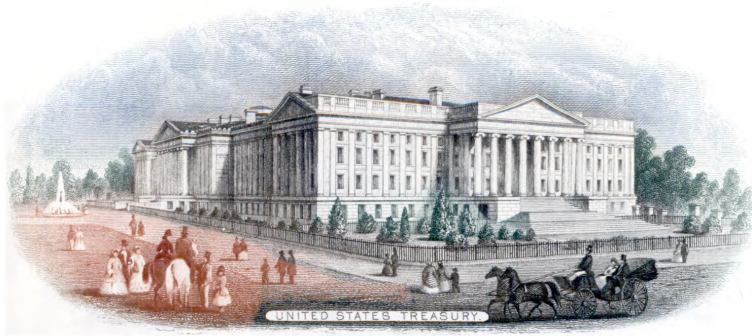
THE IDEA of publishing a history of the Bureau of Engraving and Printing to commemorate the centennial anniversary of its establishment was nurtured in the knowledge that a recital of its accomplishments was a story that well deserved the telling. It is not a subject that has been dealt with widely. Much of what has already appeared in print concerning the Bureau is in the nature of guidebook material or relates to its products, especially currency notes and stamps, rather than to the agency itself.

The purpose of this volume is to fill that gap—to tell the story of the happenings and conditions that have had an intrinsic bearing on the printing of our Government's securities.

Throughout the events recounted here will be found a definite consistency in one common endeavor, and that is the constant striving for excellence of the printed products and the timeliness in meeting the monetary and security needs of the Nation at peace and at war. These engravings, touched with an artistic eloquence that portrays the strength, the integrity, and the dignity of the sovereign state, have earned an unswerving respect through their character and perfection.

This enduring excellence is a magnificent tribute to those public servants who plodded faithfully through the century and peopled this story.

Henry J. Holtzelars
Director.



Engraved and Printed at the
Bureau, Engraving & Printing.

ORIGINAL HOME
1862 • 1880



FIRST BUILDING
1880 - 1914

Centennial
★
*Bureau
of
Engraving
and
Printing*



MAIN BUILDING
1914



BUREAU OF ENGRAVING AND PRINTING ANNEX
1938

Washington, D.C.

Acknowledgment

THIS HISTORY of the Bureau of Engraving and Printing is the product of many persons' efforts. Regretfully, it is impractical to cite all those who have had a part in the preparation of the volume, for their names are legion. Innumerable Bureau employees, both those now on the rolls and those who have joined the ranks of the retired, gave invaluable suggestions concerning points warranting coverage in this story and contributed their recollections of those events. Many persons, in other Government agencies and in private life as well, willingly gave their time and advice. Each has the deep gratitude of the history staff.

Appreciation for their help is accorded the staffs of the—

Bureau Issues Association

Columbia Historical Society

Library of Congress:

Information and Publications Office

Manuscripts Division

Prints and Photographs Division

National Archives and Records Service:

Diplomatic, Legal, and Fiscal Branch

Legislative Branch

Social and Economic Branch

Treasury Department:

Office of the Assistant to the Secretary (Public Affairs)

Library

Division of Retired Securities, Bureau of the Public Debt

U.S. National Museum:

Division of Numismatics, Department of Civil History

Division of Philately and Postal History, Department of Civil History

U.S. Patent Office:

Examining Division Handling the Printing Art

Scientific Library

A special note of thanks is tendered Hope K. Holdcamper and Philip R. Ward of the Diplomatic, Legal, and Fiscal Branch, National Archives and Records Service, George P. Perros of the Legislative Branch of that Service, and William E. Lind of the Social and Economic Branch, for their patient and unstinting assistance in locating historical and legislative material pertaining to the Bureau and the Treasury Department; Edith R. Saul, Chief, and C. Frances Manwaring, Assistant, Washingtoniana Division, District of Columbia Public Library, for help in securing data concerning the Bureau in the community life of the Capital; and Geneva H. Penley, Documents Librarian, National Archives Library, who so graciously gave her time, talents, and advice in locating and making available legislative background material for this history. Her insight and encouragement did much to bring this volume to fruition.

Contents

	Page
Centennial History Staff	II
Foreword	III
Acknowledgment	V
Contents	VII
Introduction	XI
An Ancient Art	XI
Copperplate Printing of Securities	XIII
A New American Industry	XIV
Mechanical Steel Plate Engraving	XVI
Banknote Printing Becomes of Age	XVII
The Need for Federal Paper Currency	XVIII
CHAPTER I. The Early Years (1862-1867)	1
Foundation Stones	2
The Bureau's Charter	3
Printing at the Department	5
Original Engraving Staff	7
Fractional Currency	8
Other Early Production	13
The 1864 Investigation	13
The Green in "Greenbacks"	17
Hydrostatic Printing	18
CHAPTER II. Growing Pains—a name of its own (1868-1879)	21
First International Award	24
Internal Revenue Stamps	27
Power Plate Printing Presses	30
Distinctive Currency Paper	35
CHAPTER III. The Bureau Comes of Age—a home of its own (1880-1893)	40
The 1880 Rule Book	49
The Civil Service and Servants	52
Division of Work	57
CHAPTER IV. Production Expanded—new horizons in a new century (1894-1913)	60
Philippine Currency and Postage Stamps	65
Coiled Postage Stamps	67
Savings from Improved Methods	71
	vii

CHAPTER	IV. Production Expanded—Continued	Page
	Currency Laundering Machines.....	76
	Rotary Web-Fed Postage Stamp Press.....	79
CHAPTER	V. A Bigger Home—an expanded workload (1914–1928).....	84
	Supply Problems.....	90
	Liberty Loan Bonds.....	92
	Photolithographic Offset Printing.....	95
	Offset Printed Postage Stamps.....	97
	Space at a Premium.....	98
	Wartime Personal Effort.....	99
	A Bit of Nostalgia.....	101
	Postwar Years.....	102
	The Dismissal Fiasco.....	103
	Power Presses Vindicated.....	106
	Electrolytic Plates.....	108
CHAPTER	VI. A Smaller Product—the depression and national recovery (1929–1940).....	110
	The End of an Era.....	114
	Extensive Furlough Plan.....	115
	“Emergency Currency”.....	116
	A Big Check Job.....	117
	“Baby Bonds” and Other Securities.....	119
	New Currency Designs.....	121
	Printing of Foreign Currencies.....	123
	Development of Electric-Eye Perforating Equipment.....	125
	The Annex Building.....	128
	Expanded Research and Development Program.....	130
	Two Notable Sets of Postage Stamps.....	131
	Food and Cotton Order Stamps.....	134
CHAPTER	VII. World War II Years—the Bureau on the home-front (1941–1948).....	137
	War Savings Bonds.....	138
	A Dime at a Time.....	140
	Money as a Weapon.....	141
	Military Postage Stamps.....	147
	Cloaks and Daggers and Currency.....	148
	“Overrun Countries” Stamps.....	149
	“R” and “S” Notes.....	149
	Personal Effort.....	150

CONTENTS

IX

CHAPTER VII. World War II Years—Continued	Page
The Bureau as a Tourist Attraction	151
The Case of the Russian Plates	153
CHAPTER VIII. Technological Advancement—new ways for old (1949–1962)	156
Nonoffset Inks	157
18-Subject Currency	159
Flatbed Plate Printing Press Improvements . . .	159
New Designs for Federal Reserve Notes	163
Business-Type Budget	165
Payment for Lost Sheets	166
High-Speed Stamp Presses	167
The “Big” Robbery	169
Sheet-Fed Dry Printing	172
“In God We Trust”	176
Job Security	178
Multicolor Postage Stamps	179
Project Mercury Stamp	181
Finis	183
Bibliography	186
Index	189



THE COAT OF ARMS OF
THE UNITED STATES
OF AMERICA

BUREAU OF ENGRAVING AND PRINTING, LITHO.

Introduction

THE PRINCIPAL means of printing at the Bureau of Engraving and Printing is from intaglio plates made from hand-engraved dies. Typographic and lithographic methods of printing are also employed here, but these and other methods like gravure printing are all absolutely reliant on photographic processes for pictorial reproduction. Consequently, they lack the fidelity of fine line inherent in steel engraving and do not possess the distinctive third-dimensional effect of ink deposited on paper. These features have long been the principal means for legitimate producers of paper securities to deter counterfeiting. Today as a further protection, distinctive paper and secretly formulated inks are used in the printing of U.S. securities, but the last bastion of defense lies in the exactness of the myriad of lines that must be plate printed to reproduce the image engraved on the steel die. It is this challenge that makes a good counterfeit rare and a perfect one virtually impossible.

An Ancient Art

Aborigines of every culture utilized cut or scratched lines for decorating the surfaces of their most cherished possessions. The extension of this practice through several ages led to excellent achievements in the decoration of metals. By the time of the Renaissance, the burin or graver had become a familiar tool in the skilled hands of goldsmiths and other workers in non-ferrous metals. Also, the techniques of etching lines with acid were highly developed in the art of decorating arms and armor.

A particular metal decorative art called niello, an Italian word that can be loosely translated as "a little black line," was to become a direct link to plate printing. Originally developed by the Romans and known to all the civilized world up through the Middle Ages, it consisted of engraving metallic surfaces with fine lines and filling the cuts with a hard dark amalgam. Some clever craftsmen found that in the production of certain small flat pieces

an image could be retained as a memorial or guide for future work by first smoking the piece, then wiping off the surface with oil, and applying damp paper under pressure through rubbing or boning. The oily, sooty substance remaining in the engraved lines would then transfer to the paper, revealing the effect of a pen sketch. Vasari, the early Florentine artist, credits the master Italian niello worker, Maso Finiguerra, with discovery of this process in the mid-15th century. Evidence now exists that earlier German and Italian workers may have employed this principle, but only for purposes of record. In the surviving impressions of all this work the figures are shown to be left handed, whereas if they had been intended as finished prints the figures would be right handed. It does seem proper, however, to credit Finiguerra with the earliest use of the hand roller in making impressions, a first step toward the invention of the roller printing press for intaglio plates. The initial use of this system as a conscious means of printing is obscure, but it is known that several early engravers employed this method of reproduction. These seem to start with another Italian, Baccio Baldini, which would place the effort nearly contemporary with Finiguerra. Baldini's work was, of course, engraved in reverse to print correctly and heavy ink was used.

One of the first artists to engrave in ferrous metal for printing was the German, Albrecht Dürer. His finest work, however, was engraved in copper. Although a copy of Euclid's *Principles* had diagrams printed from copper in 1482, they must have been produced by hand rollers, since the copperplate printing press is not known to have been invented until 1545. The construction principles of this press still survive for all hand plate printing presses.

Many fine artists were attracted to this new graphic art and its practitioners form a roster of famous names. Plates made for book illustration seem in a general sense to have formed the traditions of security printing. The aim was to make each impression from a plate like its predecessor; consequently, the intaglio line had to be kept clean and free from undercuts and burs, or raised metal. The printer had to carefully hand-polish the plate to remove all ink other than that deposited in the cut or etched lines. By contrast, the fine soft prints of Rembrandt are often distinguished by the burs of dry-point work and carefully developed effects in the wiping of the inks. These techniques were highly effective for the result desired, but created such variations induced by wear of the plate and the individual styles of wiping that they could not be employed for even the small editions of his day.

The production of copperplate book illustrations and title pages throughout a long period undoubtedly developed the disciplines for styles of engraving first used in plate printed currency.

Copperplate Printing of Securities

The techniques of copperplate printing for book illustration seem to have been earliest applied to printing of paper money of the best quality in mid-17th-century England. With the ever-present scarcity of coin in the American colonies, paper specie from England had some use as a medium of exchange from the earliest days of settlement on our shores. Much of this, however, was produced by typographic printing with some woodcut design after the custom of the Chinese hundreds of years earlier.

The first government paper currency in America was issued by the Massachusetts Bay Colony in 1690 to pay the soldiers fortunate enough to have returned from an unsuccessful and therefore bootyless campaign in Canada. These bills of credit were printed from crudely engraved copper plates and became debased not only by early counterfeiters but by the established habit of discounting paper money in exchange for coin. Money of a more attractive appearance was issued in the mid-18th century by several colonies. In spite of more artistic engraving, the deficiencies of copper for security printing prevented effectual stops to counterfeiting. In addition, the ranks of illegal artists were growing, because many who had served an "apprenticeship" in the old country came to the colonies to escape the severe consequences of their acts. Imitation was made easy by the fact that the best cut copper plates were limited to about 5,000 impressions before it was necessary to recut the plate or make an entirely new engraving. The best trained hands could not produce faithful copies and there was no transfer process available to make printing plates bearing two identical designs; thus, hand-engraved two-subject plates showed variants in lining.

A prouder note is that Benjamin Franklin in the late 1720's was engaged in printing notes for the colony of New Jersey. He wrote in reference to the contract, "I contriv'd a copperplate press for it [carrying out the contract], the first that had been seen in the country; I cut several ornaments and checks for the bills. We went together to Burlington [New Jersey], where I executed the whole to satisfaction;" Paul Revere was another eminent American in this field. He engraved and printed the notes issued by the Provincial Congress of Massachusetts in 1775, the first paper money issued by any of the revolutionary governments that eventually formed the United States.

An unfortunate chapter in our monetary history is reflected by the survival of the well-known cliché, "not worth a Continental." The facts behind the severe debasement of the currency issued by the Continental Congress are several fold. An unchallengeable major cause was that the legitimate production of the currency far outstripped the financial resources of the revolu-



Two examples of Continental currency.

tionary government. Most of these hastily produced bills of credit were printed typographically, being ornamented with decorative blockwork cut in wooden or leaden blocks, but whether made typographically or cut in copperplate they were diligently counterfeited. Not only did the counterfeiter exercise his skill for private gain, but he often found employment and comparative safety by making Congress Bills for the British Army. This rather effective and somewhat modern means of warfare was calculated to cripple the economy of the colonies. The postrevolutionary and early Federal era saw most States return to copperplate printing for security purposes; although its production took more time, experience had shown that the counterfeiting of copperplate printing was easier to detect.

Naturally a distrust of all paper money lingered long after the disuse of Continental currency.

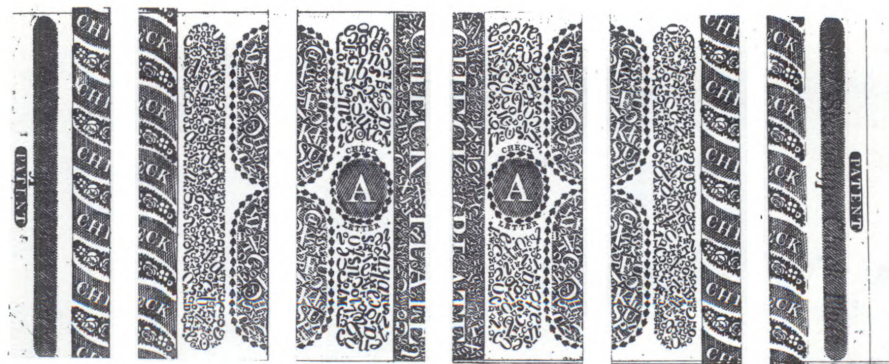
A New American Industry

The end of the 18th century would seem to mark the beginning of the modern banknote printing industry in America. It was in 1799 that a system was first patented by which paper currency could be produced bearing several identical intaglio printed units. These were then referred to as stereotype checkpoints.

As initially practiced by its inventor, Jacob Perkins of Newburyport, Mass., the system was a cumbersome method of punching lettering and designs into the walls of annealed steel cylinders (hereinafter called rolls) and crossing them with engraved intersecting lines from two directions. After the surrounding surface of the roll was cut to the same depth as the other work, the design was rolled into copper plates. This imparted to the plates multiple intaglio impressions of exact fidelity which were in reverse to the work on the roll. The name of the bank and other necessary lettering were then engraved directly on the plate. In a further development introduced about 1804, the rolls were hardened by supplying carbon to the surface through a heat process. This permitted the design to be rolled into soft steel dies, which, after hardening, were assembled in a metal frame in company with other such dies bearing punchmarks or hand engraving. It



FACE



BACK

One of the original bank notes made by the Perkins siderographic process.
 Courtesy of Mr. William H. Dillistin, Federal Reserve Bank, New York.

created an ingenious intaglio printing plate having interchangeable dies for the different banks subscribing to the system. For denominations of \$5 and above, Perkins devised a stereotype check plate for printing backs. These plates were composed by rolling designs on pieces of steel tightly clamped together which were then taken apart and interspersed with blank metal strips. This grouping when re-clamped was used as the printing medium. The resultant blank portions of a printed back provided a means whereby a questionable bill could be folded and compared with its counterpart on a specimen note. These major innovations plus the durability of steel over copper led to quick adoption of steel plate printing of securities. The State of Maine early required its use by all banks, and Massachusetts made its use by State banks mandatory in 1809.

Perkins was a very versatile man. He not only excelled as a die sinker (his original trade) but he was to make his mark in many other fields of invention. His inventiveness and practical knowledge of mechanics and metallurgy soon breeched a gap to perfect the technique of utilizing rolls to nearly present-day standards. He developed larger presses of greater power so that longer rolls could be used to transfer more work at a time and the process described above became somewhat reversed. From this point on, all engraving was done on flat dies and the use of lettering and ornamental punches was abandoned. From completed units in the form of engraved dies, rolls were taken. These, of course, had the work in relief on their surfaces. A variety of intaglio designs were thereby transferred in desired combinations on a master die. By alternate annealing and hardening of the dies and rolls, the method was carried forward to the point that the note-sized master die had its entire design impressed into one or more printing plates as many times as the size of the plates allowed. The plates were generally limited to four notes. The flexibility of this perfected method prompted Perkins and his associates to coin the word "siderography," or iron writing, from Greek word roots and the name survives today in reference to transfer press operations. This development of a new process in a burgeoning business in the then young United States soon came to the attention of the Old World where it became known as the "American System."

Mechanical Steel Plate Engraving

In 1812 an American clockmaker, Asa Spencer of Connecticut, patented a clever engine-turning device to ornament watches. It consisted of cams and gears which exerted a series of eccentric circular motions to a die clamped to a bed on the machine. A stationary point thereby traced or cut an endless design of such exceptional regularity that it became recognized as

an effective further means of foiling ever-existent and sometimes all too clever counterfeiters. In 1815 Perkins purchased the patent rights to this machine, then greatly improved, and introduced Spencer and his invention to the banknote business. The method was so completely adaptable to the earlier described transfer press that both white line and black line effects could be achieved and repeat patterns could be made into borders and cartouches or "counters." This mechanical ornamentation is difficult to counterfeit by hand engraving. Its modern value, as such a deterrent, is the difficulty encountered in reproducing it by photography. The fine white lines thus produced tend to close when the camera tries to capture on film the delicate engraving of black lines in other parts of the design. A further tax on the counterfeiter's skill is the retention of these extremes throughout his plate making and printing processes. For these reasons, money of all nations has long presented a certain generic appearance reaching back to the first use of Asa Spencer's invention.

Steel plate printing began to supplant the use of copper plates for illustration as engravers found that more delicate gradations of tone were made possible through greater durability of steel. Book publishers also found the medium profitable for illustrative purposes, as it not only permitted larger editions but required less of the printer's time. As a graphic art form, steel engraving soon gained immense popularity and attained such prestige that it became a mark of quality when used for book illustration or other purposes. Many homes of the Victorian era had large steel engraved prints as treasured decorations in their parlors. In those days such prints were the nearest approach that could be made to photographic copies of original paintings and portraits. The men who engraved them shared equal honors with the original artists because the ultimate results depended so directly upon the engravers' skill in interpreting the artists' works with attractive line.

Banknote Printing Becomes of Age

With the recognition of steel engraving as a prime security method of great prestige, every bank in the land sought to issue its own currency based to a varied degree on the bank's assets. This increasing interest led to a great growth of banknote houses to do their printing. Some of these firms had large sample sheets from which bank representatives could compose a note to their liking. Unfortunately there was little governmental supervision at the State level and less at the Federal. Obvious abuses resulted and some notes were even issued in the name of nonexistent banks. Fraudulent issues can also be attributed to the failure of some banknote companies and the subsequent sale of their assets, which often included stock bed pieces that

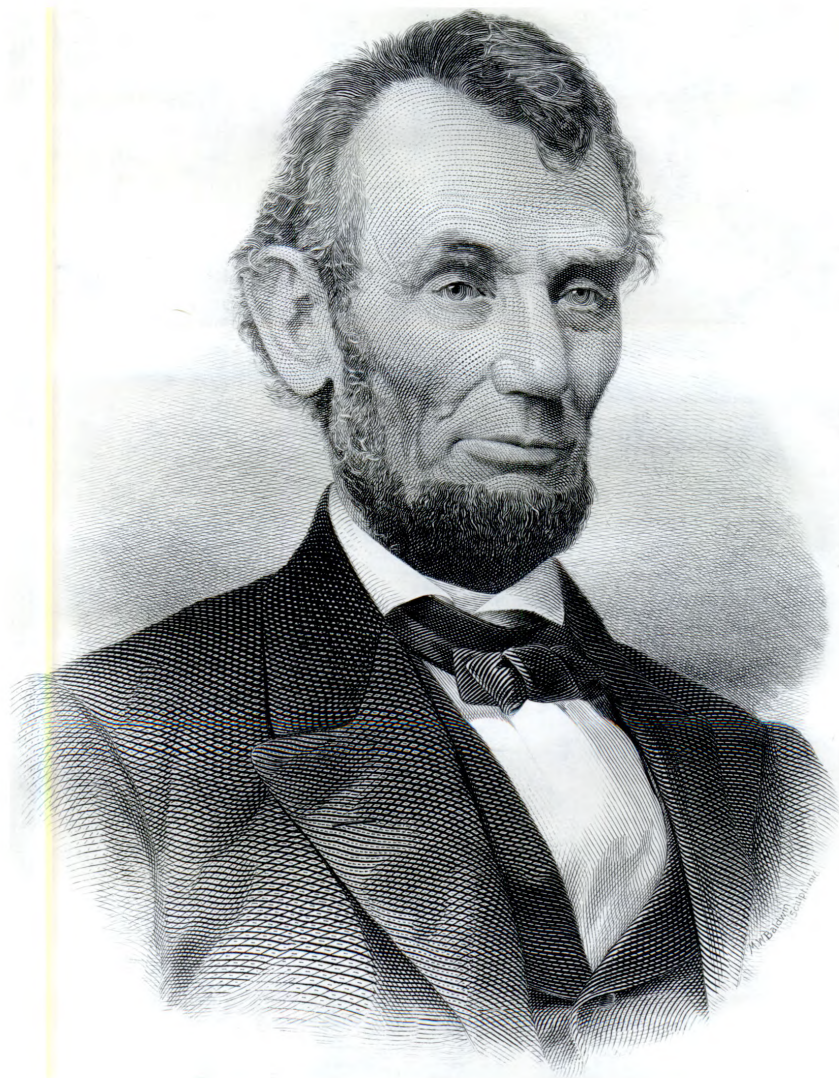
648-001 O-64-2

had been used in preparing genuine notes. In an effort to combat such a contingency, the style of tying together the transfers from stock bed pieces with hand-engraved foliate forms was developed and remains in use today.

From that time on the appearance of notes changed. The easily assembled blocks of transferred work with their rectilinear design gave way to more complex designs necessitating costly hand engraving on master dies for each note. More and more reliance was also placed on the use of portraits, as it was found that their imitation was more readily detectable by faulty lining which altered the expression of the subject.

The Need for Federal Paper Currency

From our earliest days as a Nation, coins had been the only money issued by the Government. Although monetary wealth could be accumulated and business transacted through such means as interest-bearing banknotes, the shortage of U.S. coins for day-to-day expenditures brought about many make-shifts. A bucolic means of exchange involved the keeping of scrupulous accounts and balancing off the prices of goods received against labor and services rendered. The differences were thereby resolved with a minimum use of coin. In many communities of the early frontier, out-and-out trading of such assets as livestock established currency systems akin to those of aboriginal civilizations. Tokens had long been a frequent substitute for coin in urban areas and along post roads, and a similar system prevailed in many cities of the United States up until the Civil War. These conditions and the failure of many banks in 1857 contributed to the need for issuance of Federal paper currency.



CHAPTER I The Early Years

1862—1867

THE BUREAU OF ENGRAVING AND PRINTING is an indirect consequence of the Civil War. It is primarily the result of the self-confidence, courage, ingenuity, and patriotism of one man, Spencer Morton Clark. It is, as well, the result of the foresight of Salmon P. Chase, President Lincoln's first Secretary of the Treasury, his confidence in Clark's ability, and his recognition of Clark's accomplishments.

Actually, the Bureau did not come into existence until August 29, 1862. But the groundwork for its establishment was laid a year previously.

With the firing on Fort Sumter and the President's call for volunteers to quell the ensuing state of rebellion, the Nation—already on the fringe of bankruptcy—was sadly pressed to finance a war. This and other war matters caused the President to call Congress into extra session on July 4, 1861. During this session, Secretary Chase recommended to Congress both a system of taxation and one of floating loans. His scheme for borrowing included the issuance of non-interest-bearing notes which would circulate as money. Only because of the

exigencies of the times did he make the latter proposal, urging great care "to prevent the degradation of such issues"

There was a doubt in the minds of many people as to the constitutional authority of the Government to issue paper money. Congress adopted Chase's plan in an act of July 17, 1861 (12 Stat. 259). As a result the first paper money issued by the U.S. Government came into existence. These notes became popularly known as "demand notes," a title brought about by certain provisions of their issuance. They were produced by the "New York bank note companies"; i.e., the American Bank Note Co. and the National Bank Note Co., under contract with the Government.

Foundation Stones

The total amount of money authorized to be borrowed by the original currency act was \$250 million, of which \$50 million could be in the form of non-interest-bearing notes of less than \$50 denominations but not lower than \$10. One of the provisions of this law specified that the authorized securities should be "signed by the First or Second Comptroller, or the Register of the Treasury, and countersigned by such other officer or officers of the Treasury as the Secretary of the Treasury may designate;" The impracticability of such a procedure was soon evident. If the designated officers were to perform duties other than sign their names to securities, they would have to be relieved of that task. Corrective action was immediately forthcoming. Just 19 days after the enactment of the original law, President Lincoln signed a bill on August 5, 1861, that changed the signature requirements to those of the Treasurer of the United States and the Register of the Treasury (12 Stat. 313). The new legislation also provided that the Secretary might designate other personnel to sign the notes for these officers. Ultimately a force of 70 clerks were assigned to the Loan Branch of the Secretary's office for this purpose at an annual salary of \$1,200 each. These persons signed their own names to the notes.

Experience proved that a plan which embodied a variety of signatures on the notes afforded little security to the issues. Spencer Clark, the chief clerk of the Bureau of Construction in the Department, who at that time was Acting Engineer in Charge of that Bureau, suggested to

Secretary Chase that the notes be imprinted with the facsimile signatures of the required officers. He also proposed that the notes be imprinted with a copy of the Treasury seal as additional evidence of lawful issue. Further, he suggested that this processing be done in the Treasury building. The Secretary approved Clark's proposal and appealed to Congress for authority to execute the ideas. This authorization was given in an act approved February 25, 1862 (12 Stat. 346). Clark was then instructed to design a seal for use on the notes and to procure the necessary machinery for the imprinting. Clark carried out these instructions, and the Treasury thus began its first work in connection with the printing of currency.

A variation of the seal originally designed by Clark is still used on the Nation's securities. He described his original design as having for "its interior a *facsimile* of the seal adopted by the Treasury Department for its documents on a ground of geometric lathe work, the exterior being composed of thirty-four points, similarly executed. These points were designed to be typical of the thirty-four States, and to simulate the appearance of the seals ordinarily affixed to public documents." Loyal to the Government, Clark gave no recognition to the rebellion then in progress and included a point in his design for each of the 11 States then in secession. He was especially proud of his product. To quote his words, "It [the seal design] was difficult of execution, and it was believed that counterfeiters could not readily make a successful imitation of it. So far [1864] the belief has seemed well founded, for it

has not, that I am aware of, been successfully imitated."

In urging his plan upon the Secretary, Clark believed that it would be both proper and economical to print the signatures "by a peculiar process and with peculiar ink." Arrangements were made to secure two presses for overprinting the signatures on the notes. This operation was commenced in March 1862. It is not clear from the early records how long the practice was continued. The earliest plate proof impressions of currency notes now on file in the Bureau (\$10 Compound Interest Treasury notes and \$10 Interest Bearing notes, issued under an act of March 3, 1863) show that the signatures were engraved in the plates.

The notes as printed in sheets of four subjects by the banknote companies were delivered to the Treasury for final processing and issuance. Originally the sheets were trimmed and separated manually by the use of shears. Some 70 women were employed at this task at a monthly salary of \$50. Clark, as supervisor of the Bureau of Construction, gave considerable thought to the tediousness and expense of this hand labor. He was authorized to construct two machines on a trial basis—one for trimming the four-subject sheets and the other for separating and trimming the individual notes. The machines were constructed to be operated by a hand crank and were placed under the charge of the Loan Branch. The trials were reported as a failure to the Secretary, who ordered removal of the machines. However, at Clark's request the Secretary made a personal inspection of the machinery. Convinced of their effectiveness, Chase rescinded his

order. He directed Clark to submit a plan for performing the work on machines propelled by steam, to be operated under Clark's immediate charge.

The Bureau's Charter

Clark's plan was submitted in the spring of 1862 but was not acted upon until the following August. At that time he was directed to prepare a letter of instruction for his guidance in carrying out the project, for submission to the Secretary for review.

That letter, as approved by the Secretary, is in essence the Bureau's charter. It was as follows:

TREASURY DEPARTMENT
August 22, 1862

SIR: You are hereby instructed to take charge of the preparation for the issue of the one and two dollar Treasury Notes, in accordance, as near as practicable, with your programme, now on file, of the 10th of April, 1862.

This order is not issued as a permanency. It is my intention to give the experiment of machinery a full and fair trial, and this order is issued for that purpose.

A reasonably sufficient time will be given for a fair trial, and my future orders will depend on the result of that trial. If it is not more economical and better than the present method, its use will not be continued.

You will, therefore, on and after Monday next, receive from the mail the one and two dollar notes, making the customary receipt therefor, and after sealing and trimming deliver them to the Treasurer, and take his receipt. You will keep a perfect record at every step, using all the checks and guards now used in the organization for larger notes, with such additional checks as you may deem proper

that do not involve additional cost, and may seem to you additional security. You will make a daily report of the amount of notes on hand, amount received from the engraver, the amount delivered to the Treasurer, and the amount in your hands at the close of work on each day, showing under each head the respective quantity of ones and twos, and also aggregating the total amounts of all bills received from the engravers up to the date of the report, with respective amounts of ones and twos.

You will also keep a daily record, in a book prepared for that purpose, of each day's work, and its cost, for which you will render a weekly statement, or if hereafter ordered, a daily statement.

The sealing press in the hall, which has been ordered up stairs, you will now remove below, together with the new counter shafts and pullies designed for the new presses, and place them with the two presses ordered, in the room below, adjacent to the cutters.

Very respectfully,

S. P. CHASE

Secretary of the Treasury.

S. M. CLARK, Esq.,

Chief Clerk Bureau of Construction.

Within 7 days, a steam engine and boiler were procured and set up with the necessary auxiliary equipment in the southwest room of the south wing of the



The title of this picture, which appeared in Ellis' "Sights and Secrets of the National Capital"—the "inside story" of its day (1869)—is a misnomer. This is a view of the bronzing or sealing operation, rather than the pressroom, where the notes were plate printed. The shortage of workspace probably necessitated the erection of the gallery shown on the right. The ladies seated there were examiners.

basement of the main Treasury building. Presses for sealing, trimmers, and separators were likewise installed. Little was foretold of the gigantic scope of operation to be performed over the next 100 years in the terse statement contained in Clark's first formal report written in November 1864, relative to the establishing of the Bureau:

On the 29th day of August, 1862, I commenced the work with one male assistant and four female operatives.

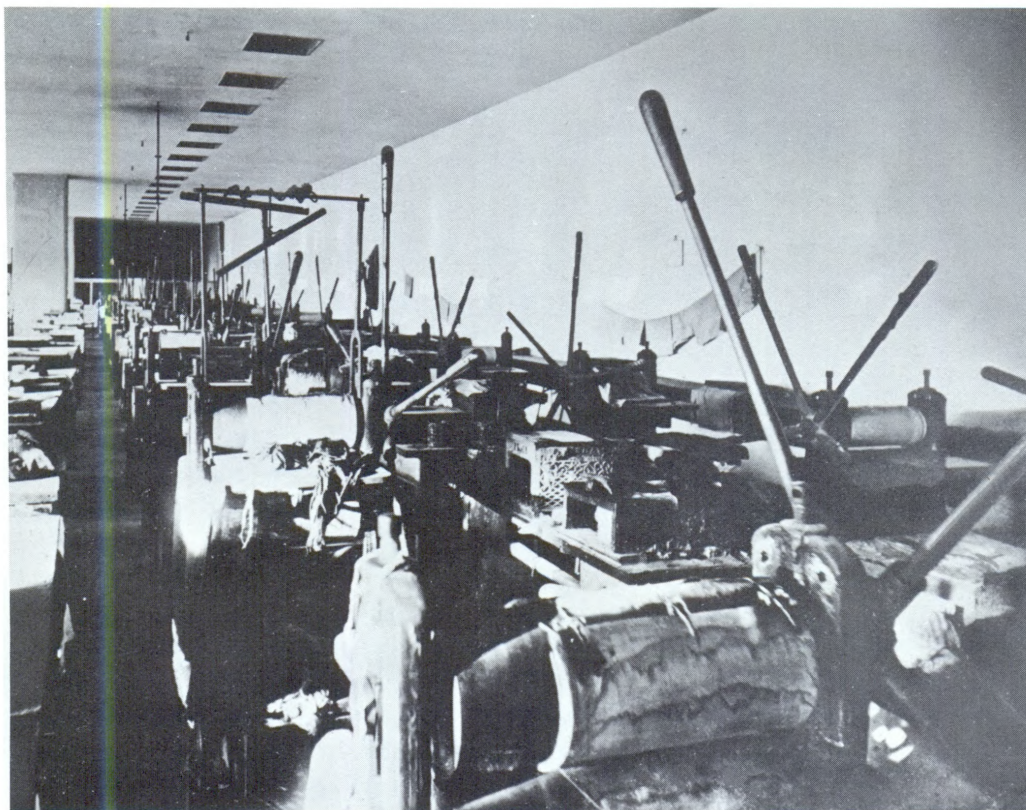
The work progressed well under Clark. Secretary Chase, in a diary entry for September 13, 1862, wrote: "Visited Mr. Clark's Sealing and trimming machines for the ones and twos and found them a perfect success; and the ones and twos are sealed and trimmed by machinery, attended for the most part by women, with such prodigious advantage to the Government that it seems difficult to imagine that coining, except in large masses, can be of much utility hereafter." The success of the experiment is attested by the assignment of the processing of all denominations of notes to Clark's charge in January 1863.

Printing at the Department

Meanwhile, gratified by the economies achieved through the use of Clark's trimming and separating machines, Secretary Chase had requested him to look for further possibilities relating to the production of Government securities. In carrying out this assignment, Clark stated that his "attention was thus called for the first time" to the enormous prices charged the Government by the private

banknote companies for printing the notes. After carefully investigating the various ramifications, Clark reported that he felt he could produce the work in the Department "for a comparatively small outlay, at a great saving of cost in the issues." The Secretary had introduced in Congress a proposal, based on this report, authorizing the engraving and printing of the notes at the Treasury in Washington. That authority was given under an act approved July 11, 1862 (12 Stat. 532).

Thus, at the same time that Clark was in the throes of firmly establishing the currency-finishing operations, it fell to him to arrange for engraving and printing securities at the Department. This he accomplished with his usual zeal and efficiency. In August 1862, a little more than a month after passage of the law authorizing such work to be done in the Treasury, he reported to Secretary Chase that the first engraver hired was progressing satisfactorily. That engraver was James Duthie who was engaged on a temporary basis at \$1,600 a year, with the understanding that he would "be advanced to fair engravers wages, if the work should be continued." At the time of Clark's letter, Duthie had already etched on steel the design for a new \$1 Treasury note and was preparing to etch the design for a \$2 denomination. These designs were never used. The demand for more immediately needed work compelled the suspension of the project. Clark expressed the hope in his 1864 report that they would be used for a new series then being considered as a replacement of the 1862 series of U.S. notes, but that idea did not materialize.



The currency pressroom located in the attic of the Main Treasury Building. This photograph, from the National Archives' Matthew Brady collection, is believed to have been taken during the mid-1860's.

By October 1862 the engraving and plate printing units were beginning to take definite form. Duthie was sent to New York in an endeavor to persuade Joseph P. Ourdan, one of the country's better known portrait engravers, and Archibald McLees, a letter engraver, to come to Washington. A memorandum history, prepared in 1880 by O. H. Irish, then Chief of the Bureau, gives November 20, 1862, as the date that the nucleus of the engraving staff, comprising two engravers and a transferrer, began its work.

The date of the first printing in the Department is in question. In July 1862 Charles Neale, a plate printer, had been brought into the Department as a clerk in anticipation of authority to print currency at the Treasury. On October 11, 1862, he was appointed to superintend the plate printing operation and was assigned the tasks of securing presses, ink, and paper, and recruiting workmen. Evidently, Neale had difficulty inducing printers to come to the Department. Paper money issued by the Government was novel. There were misgivings as to

the success of the proposed printing venture, and even if it should be successful, many persons were doubtful of its permanency. Neale was instructed to have the men he hired report for duty any time after November 1, 1862. A congressional report of 1864 states, "In the autumn of 1862, the printing of some of the public moneys was begun in the treasury." However, on December 13, 1862, Clark wrote Secretary Chase, "No printers are yet employed." According to Irish's account, plate printing in the Treasury did not commence until January 1863.

Original Engraving Staff

One of Spencer Clark's executive talents was the knack of selecting skilled artists and tradesmen and securing their services. This was particularly true in his choice of engravers. With his aforementioned letter of August 22, 1862, reporting on the progress of engraving plates for Treasury notes in the Department, Clark submitted a list of American engravers of known reputation, with his comments on their abilities and backgrounds. His notations pertaining to those whom he preferred to hire are indicative of his desire to secure only the best in the field. Two of those named, Joseph P. Ourdan and John F. E. Prud'homme, eventually came to work for the Department and he was successful in contracting for the service of some of the others on a piece basis—Charles Burt, Louis Delnoce, and Alfred Sealey. James Duthie succeeded in his recruiting assignment. McLees was hired on October 20, 1862, and later that same year Joseph P. Ourdan reported for

duty. Ourdan was to be followed into the service by his father, Joseph James P. Ourdan. Theirs was a case of a switch in the usual father-son relationship. The elder Ourdan had been instructed in the art of engraving by his son and became an expert letter engraver.

The Bureau's first engraver, James Duthie, was a skilled etcher. He served as Superintendent of Engraving until about 1865. Duthie left the service to go into business with a Mr. Idlitz, who had conducted experiments at the Bureau to perfect an electrotypes plate for printing parts of securities. One of Duthie's famous works was the dock scene that was used on all denominations of the first issue of fractional currency. This vignette depicted steamboats at the water's edge, with gangplanks down, cargo piled high on the wharf, a horse-drawn dray awaiting unloading, and a smoking steam engine in the distance.

Another early craftsman was Elisha Hobart, who had been trained as an engraver but who later became a transferer. He was employed at the Department in the latter capacity. Hobart is noted for his earlier engraving of Sargent's painting, "Landing of the Pilgrims," on which he had worked for 2 years. His Bureau career was cut short by his death when he was returning from an excursion with some other Department employees to Harper's Ferry, W. Va. He was an organizer and captain of Company B, 93d N.Y. Volunteer Infantry. An official history of that group gives a biography of Hobart, partially quoted here:

After leaving the service, his inventive genius came to his aid, and a transfer



Elisha Hobart.

press of his construction was adopted for printing [*sic*] fractional currency, and he obtained employment in the Treasury Department at Washington, where he remained until his death, July 4, 1864, when he, with other employees in the department, went on an excursion up the canal to Harper's Ferry. On their return, at Point of Rocks, they were fired upon by Mosby's guerillas, and Hobart, standing bravely at his post, fell, while endeavoring to save the boat and protect the escape of his comrades. I have never been able to get the full details of that disastrous excursion, but from what I can learn, if obtained, they would reflect more credit upon him than some of those with him, and to show that his death was unnecessary.

In December 1862, Clark employed George W. Casilear, who was to spend the greater part of his career at the Bu-

reau. Originally hired as an engraver, he was soon afterward appointed the Custodian of Dies and Rolls in recognition of his administrative ability. Later, he was promoted to the position of Superintendent of Engraving and served in that capacity, except during President Cleveland's first administration, until mid-October 1893. Casilear was noted both as an engraver and as a landscape artist. While serving as Custodian, he had little time left to give to his craft during regular work hours. Testifying before a congressional committee in March 1869 relative to overtime expense in the Bureau, Clark stated that Casilear had been paid for extra work as an etcher. He described Casilear as a "very skillful etcher, and to some extent a toner." Casilear was particularly adept in doing matchwork, where two or more designs had been laid down from separate rolls and had to be brought together by handwork to form a consolidated unit.

Another early engraver was Henry Gugler, who was hired on January 15, 1863. Gugler was a native of Germany and had been in this country only 10 years at the time of his appointment. One of his most important works was a life-sized steel engraving of President Lincoln. He later founded the lithographic firm of H. Gugler & Son, in Milwaukee, Wis., which is in existence today as the Gugler Lithographic Co.

Fractional Currency

One of the very first products produced by the Bureau, and certainly among the unique, was fractional currency. These were the miniature notes issued by the

Government in place of coins during the Civil War and for some 10 years afterward. It can truly be said that they came into existence by a "spin of the wheel of fortune." They were the replacements for postage notes which, in retrospect, were of doubtful legal origin.

The optimism of quick suppression of the Rebellion, expressed in President Lincoln's first call for volunteers to the number of only 75,000 for a 90-day enlistment, quickly faded with the initial defeats suffered by the Union forces. Hoarding of coins by the timorous and avaricious soon followed. A case in point was the instance where a house in New York City collapsed from the weight of the coin cached there. Thousands of dollars in coin were secreted each day.

Into this vacuum flowed privately issued tokens and scrip. The idea was certainly not new. "Shinplaster" had become a derisive term applied to scrip, an outgrowth of public reaction to the worthless notes issued by private banks during the depression of 1837. General Sherman's contemporary excoriation of scrip as a medium of exchange and his proposed alternative give a particularly acid evaluation of this paper during the early years of the war:

HEADQUARTERS, DIST. OF MEMPHIS
Memphis, Nov. 26, 1862

To the Mayor and Common Council of
the City of Memphis:

GENTLEMEN: I regret to notice that you propose to issue a species of currency of denominations as low as ten cents—"shinplaster" to swell the amount of bad money with which your community is already afflicted.

The issuing of bills of credit by way of money is, in my judgment, in direct

violation of the Constitution of the United States; and I think Congress, at the last session, passed a bill prohibiting all issues below one dollar, and provided a species of currency called "post-office currency", which will soon supplant the worthless trash which now is a disgrace to the name of money. As soon as possible, enough of the post-office money will come here, and suffice for the wants of the people.

* * *

Why do you not use cotton for money? It has a very convenient price—fifty cents a pound. Put it up in pounds and fractions, and it will form a far better currency than the miserable shinplasters you propose.

* * *

If it be my last act, I wish to spare the people of Memphis from the curse of any more bad money.

Yours in haste,

W. T. SHERMAN
Major-General Commanding

The circulation of such a variety of items intended as substitute coins, in Secretary Chase's words, "created a manifest necessity for a fractional currency authorized by the national government." He proposed alternative remedies: one, reduce the weight of small coins; the other, use revenue or postage stamps in place of coins. Congress preferred the latter and by an act approved July 17, 1862 (12 Stat. 592), provided that postage or other U.S. stamps be receivable in payments due to the Government. The same act made the use of any items intended to circulate as money in amounts of less than \$1 unlawful.

Realizing that the glue on stamps would make them inconvenient for the purpose, the Secretary requested the Postmaster General to supply stocks without adhesive. The suggestion resulted in an ar-



The face and back of the 5-cent note of the original issue of fractional currency showing the bronzed oval and skeleton-type denominational numeral.

rangement by the Post Office Department with private banknote companies for printing small notes comprising in their design reproductions of postage stamps. They were printed in denominations of 5, 10, 25, and 50 cents. The legend appearing on the reverse of these notes implies that they were issued under the act of July 17, 1862. However, that act does not make any mention of postage currency whatsoever.

In Chase's opinion, postage currency "lacked some important requisites to protect it against counterfeiting." There was a need for speedy printing and processing. Then too, the cost "was believed to be unwarrantably great." As a result, the Secretary was authorized by an act of March 3, 1863, to issue fractional notes, and, if he saw fit, to have them engraved and printed "in the treasury department building" (12 Stat. 711). In providing for fractional currency this law took cognizance of the existence of postage notes. Any doubt as to the "legality" of the latter was erased by the second law relative to fractional currency signed on June 30, 1864 (13 Stat. 220), which provided that it would "apply equally and with like force to all the fractional notes heretofore authorized, whether known as postage currency, or otherwise,"

With the passage of the enabling legislation, the engraving staff was immediately assigned to prepare the necessary dies and plates, paper was procured, a protective bronzing process was developed, and the work was printed. The first issuance of the notes occurred on October 10, 1863.

Except for the valuation numerals on the faces and backs, the notes of the first

issue of fractional currency¹ were identical in design for all denominations. Unique to this series were a bronzed oval encircling the face portrait and large skeleton-type denominational numerals on the backs. The process was the invention of Spencer M. Clark. It was also used for the early bonds produced in the Department.

Little of the essential details of bronzing is now available. It is known that the feature was placed on the paper prior to printing. Apparently, it was a protective device against counterfeiting. In the duplication of a note by photography the bronzed area would appear in black and any attempt to simulate the metallic coloring would hide the engraved detail. Clark was more than pleased with the success of the process. He described the bronzing feature as having "defied all the attempts of the scientific commission² to successfully remove it, although they had the advantage of being informed of what materials it was composed." He further stated that he had "never seen a piece of paper from which it has been removed, without also removing the engraving." Use of this feature on fractional currency was confined to the first issue and the reason for its discontinuance is unknown.

In all, there were four issues of fractional currency. The first two were printed wholly at the Department; the

¹ Many numismatic publications regard postage notes as the first issue of fractional currency, consequently, accounting for a total of five issues. References made in this history are based on the early records of the Treasury Department which refer to those notes issued beginning Oct. 10, 1863, as the first issue.

² No information could be found about the commission to which Clark refers.



The controversial 5-cent note of the second issue of fractional currency bearing the portrait of Spencer Morton Clark, first chief of the First Division of the National Currency Bureau, now the Bureau of Engraving and Printing.

greater part of the notes of the third issue were produced by private banknote companies but were sealed by the plate printing process at the Bureau. There were three different 50-cent notes in the third issue. The faces of two of these were printed at the Bureau. The faces of the fourth issue were done at the Bureau and the work on the backs was done by a private banknote company.

The second issue of fractional currency proved to be the most controversial. It was in this issue that a new denomination of 3 cents was introduced. Doubt was expressed as to the actual need for it. (This was the lowest denomination of fractional currency and was peculiar to the second issue.) There was an outcry because the portrait of Spencer M. Clark was used on the 5-cent note. This mat-

ter was the subject of a running controversy in the columns of the *New-York Times* of the day and a topic of editorial comment by that newspaper. It reached the floor of Congress and resulted in the passage of the law that remains in effect today prohibiting the use of a portrait of any living person on a security of the United States (14 Stat. 25). Clark bore the sole brunt of criticism in the situation. The fact that the likeness of Francis E. Spinner, the then very much alive Treasurer of the United States, appeared on the 50-cent note was ignored.

It was originally planned to include a 15-cent note in the second issue. Work on these notes had progressed to a stage just short of printing production—in fact, one-sided printings had been issued as specimens—when the non-living-person-

age portrait law became effective. Since the design for the note included the portraits of Generals Grant and Sherman, both of whom were then alive, the project was abandoned. The third issue of fractional currency, however, did include notes of this denomination.

Fractional currency continued to be issued until February 23, 1876. The amount authorized was \$50 million; however, the total quantity placed in circulation, including reissues, exceeded \$368,720,000. Today, it is estimated that more than \$1,965,000 of these notes remain outstanding.

Other Early Production

As has already been mentioned, the first security work undertaken at the Treasury Department was that of engraving designs for new Treasury notes. However, the project was not completed. Clark gave as the reason, that the demand for other "more immediately needed issues" compelled the suspension of the job. Just what work was so pressing is not clear. It could have well been fractional currency. In 1899, telling of his role as an engraver with the Bureau, George Casilear recalled that, immediately upon coming to work in December of 1862, he was assigned to prepare designs for fractional currency. This work was undertaken in anticipation of the authority to issue such notes which was not actually granted until the following March.

In piecing together data contained in a congressional report of 1864 and in Clark's special report of that year, it is

found that in a little over 2 years the work accomplished at the Department included the engraving, printing, and processing of securities having a face value in excess of \$1½ billion. The first paper money produced in the Treasury establishment, other than fractional notes, was the Compound Interest notes of 1863 and 1864 and the 5-percent Treasury notes of 1863.

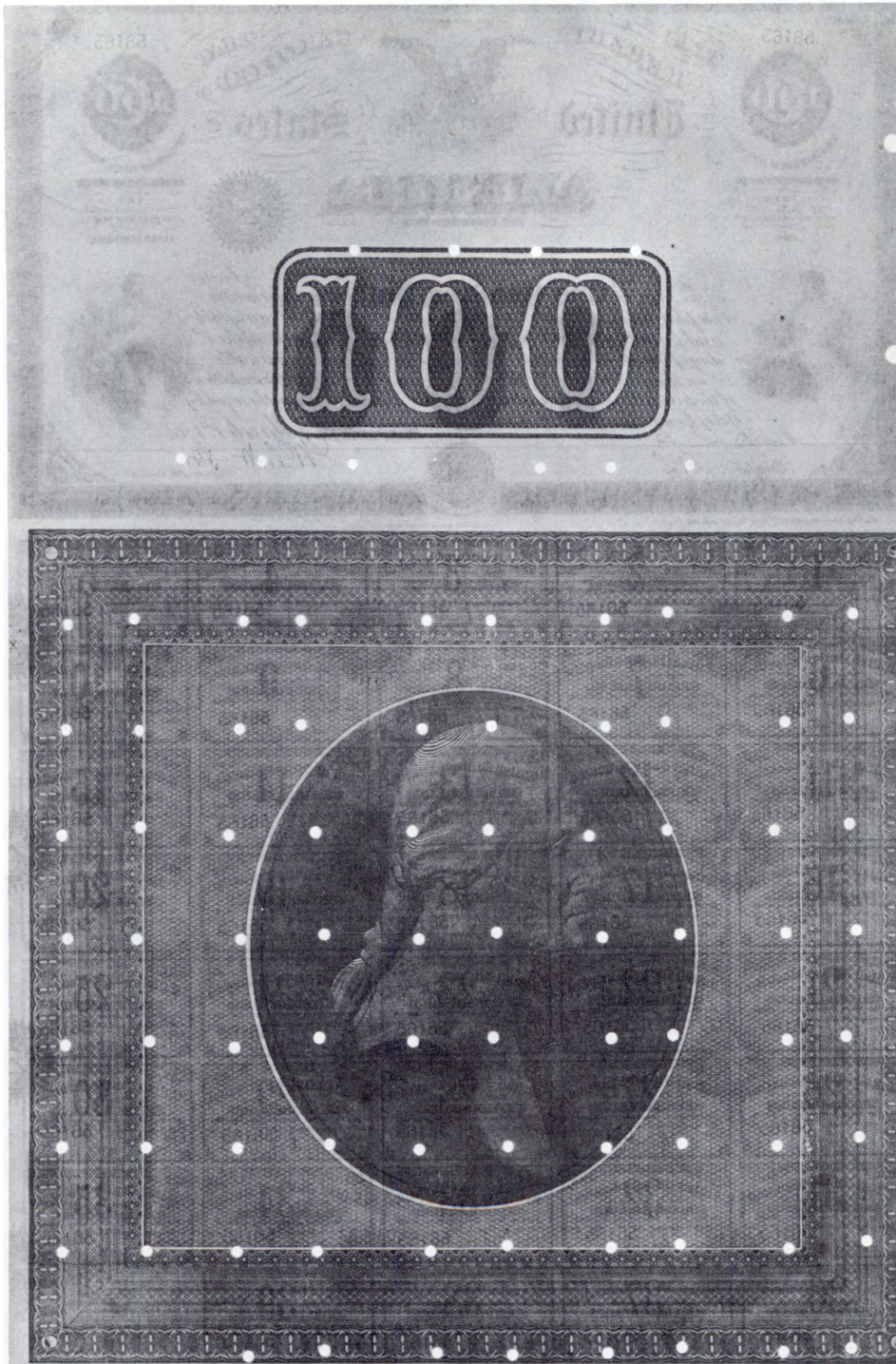
A review of a list of the equipment Clark reported in use as of November 1864 gives a good picture of the magnitude of the then-current production program—15 transfer machines, 72 hydraulic and 96 hand presses, 14 sealing presses, 6 ink mills, and 22 numbering machines. The work force at that time comprised 237 men and 288 women.

The 1864 Investigation

It was natural that there would be opposition to the printing by the Government of its paper money at the Treasury. The system, as well as Spencer Clark who was regarded as its progenitor, had its detractors in private business, among the newspapers, among various employees and officers of the Department, and in the halls of Congress. The private bank-note companies which heretofore had enjoyed a monopoly stood to lose profitable contracts; the issuance of circulating notes, regardless of the source of their production, was in itself repugnant to many people; it was felt that the use of so much machinery, as proposed, would deprive many deserving persons of employment; there were disgruntled employees; and there was intraservice rivalry



Bonds comprising the fourth issue of the class commonly referred to as the Five-Twenties of 1862 were among the first securities wholly engraved, printed, and numbered at the Treasury Department. The word "fifty" in a Victorian variant of spurred finish lettering, typical of the time, and the individual numbers of the coupons were printed in bronze prior to plate printing.



As an economy measure the backs of bonds were not engraved. This back of the \$100 bond of the Ten-Twenties of 1864 was produced typographically. It is unusual in that the design, approximately 11 inches square, was composed of a medallion head of Washington in an elaborate, geometric-patterned frame.

648-001 O-64—3

fed by jealousy of Clark's accessibility to Secretary Chase.

Undoubtedly, there were those who were sincere in their misgivings as to the propriety and practicability of the undertaking. On the other hand, there were those whose hostility was based on narrow, selfish interests. In retrospect, it is the force and tactics of this latter opposition that is astounding—character assassination not being the least of its attributes. The exaggeration of the claims contained in an article in the *New York World* for December 5, 1862, is typical. Clark answered its allegations that an "extensive portion of the Treasury building" had been set apart as a printing establishment by citing the use of one room each in the attic, basement, and cellar for the purpose; that the "costly purchases of machinery and materials" at that time did not amount to \$2,000, exclusive of a steam engine and boiler; and that the hiring of a "small army of engravers and printers and other employees" comprised but four engravers, and no printers had been engaged up to that time. It is apparent that the *World's* Washington correspondent was not as vigilant as he thought himself to be. He impugned himself with the statement, "The strangest part of the business is that Mr. Chase's proceedings have no warrant in law, . . ." The reporter erred by some 5 months, since the authority for the Department's actions had been granted in an act of the previous July (12 Stat. 532).

The multiple increase of duties which fell to the Treasury Department because of the war necessitated the hiring of

additional personnel.³ The greater majority were women—an innovation in Government service. A chronicler of the period states that Francis E. Spinner, the then Treasurer of the United States, referred to the first female employees as being "smuggled" into the Department. Women clerks in the business world were indeed a rarity. The unusual situation caused the clucking of many tongues, particularly because large forces were employed at night. Charges of fraud and promiscuity within the Department grew numerous. In the latter part of 1863, Chase borrowed Lafayette C. Baker, a War Department detective, to investigate what the Secretary regarded as false rumors of fraud in his department. Chase was embarrassed when Baker reported incidents not only of fraud but of wanton maladministration and misconduct. So many of Baker's charges were found to be baseless, and he exhibited such rashness in his investigation and conclusions, that his report was not given credence by the Secretary. The recent revelation that one of Baker's principal witnesses in his charges of immorality against Clark was later named as a beneficiary in a codicil to Baker's will, wherein she was referred to as his "longtime friend," gives support to the Secretary's doubts of Baker's veracity.

It was in this atmosphere, electrified by the political undertones of Chase's presidential aspirations, that a select committee of the House of Representatives

³ When Chase came in as Secretary, in 1861, there were only 380 clerks employed in the Treasury. At the time of his resignation in 1864, the number in the Department was 2,000.

was appointed to investigate charges against the Treasury Department. The group, consisting of nine members with James A. Garfield as chairman, commenced operations on May 3, 1864. Because of the impending close of the congressional session, the committee confined itself to looking into only two facets of the charges which seemed most pressing: the manner of printing securities in the Treasury and the alleged immoralities of persons employed there. All eyes and ears were trained on the Capitol hearings. They were the topic of the day. Leading newspapers in the country carried the story. Would the rumors be sustained?

The investigation lasted 2 months. Lafayette Baker was called before the committee to report on the results of his recent examination. Clark dubbed him "chief coadjutor" of the probe, claiming Baker was active during the probe assisting Congressman James Brooks of New York in finding testimony to support the latter's charges concerning fraud in the printing operations and misconduct on Clark's part. The committee presented its findings at the end of June. Five members submitted a majority report approving the principle of the Treasury's printing the money. They endorsed the care and generally correct manner in which the work was conducted and found the charge of immoralities baseless. Only one member of the majority group was not persuaded that the private banknote companies conspired to prevent the printing of the securities at the Department and to discredit Clark. The minority's report favored a great number of procedural and accounting changes in the system and recommended, as well, the discharge of

Clark as being unfit to preside over the printing bureau.

There the matter rested. No further action was taken by the House. The bitterness which the hearing brought to a head was to be long felt. Reputations had been smeared and honesty questioned. The Bureau's opponents were encouraged by the fact that they were strong enough to get their complaints aired before Congress. The very existence of a printing bureau was to be a political football for years to come; the 1864 investigation was the first of many to follow. Irish's 1880 history reports that Clark's acts "were made the subjects of three investigations by committees of Congress as well as by several appointed by different Secretaries of the Treasury." He went on to say, "Mr. Geo. B. McCartee who succeeded Mr. Clark on March 11, 1869 also incurred the enmity of the bank note companies and two Congressional Committees made searching inquiry into his management of the affairs of the Bureau." But still the operations of the printing bureau went forward.

The Green in "Greenbacks"

The reason for the selection of green as the color for the backs of currency notes has long been among the more popular questions put to the Bureau. It is known that at the time of the introduction of small-sized notes in 1929, the use of green was continued because pigment of that color was readily available in large quantity, the color was relatively high in its resistance to chemical and physical changes, and green was psychologically identified with the strong and stable credit of the

Government. But no definite explanation can be made for the original choice. In the course of preparing this history much attention was given to the matter. Extensive research developed evidence in support of the following explanation.

With the growing popularity of banknotes and the development of photography in the mid-1800's, it was customary to print the bills in black combined with colored tints as a deterrent to counterfeiting. The early camera saw everything in black. Features that were distinguishable on a note by color variant lost their individuality when reproduced photographically. However, the counterfeiter soon discovered that the colored inks then in use could easily be removed from a note without disturbing the black ink. He could eradicate the colored portion, photograph the remainder, and then make a desired number of copies to be overprinted with an imitation of the colored parts. The solution to the problem lay in the development of an ink that could not be erased without adversely affecting the black coloring. Such an ink was developed and the patent rights were purchased by Tracy R. Edson, who later was one of the founders of the American Bank Note Co. This is one of the same firms that produced the first paper money issued by the United States. The faces of these and other early notes produced under contract were printed with a green tint, presumably of the protective ink.

It is not unusual in printing with oil-base-type inks, such as was the "patent green," for the color to strike through to the opposite side of a sheet. It might

therefore be conjectured that the backs of the early notes were printed in a darker shade of ordinary green to make the tint "strike through" less obvious.

Since the transition to printing money exclusively at the Treasury was gradual, it is logical to presume that the backs of the notes produced there during the intervening period were printed in green for the sake of uniformity. Once the Bureau was on full-scale production there was no reason to change the traditional color and the practice was continued.

Hydrostatic Printing

A basic principle in the printing from engraved plates is the application of sufficient pressure to force the paper into the engraved lines so that it will pick up the ink deposited there. The amount of pressure required is inversely proportionate to the flexibility of the paper used. Banknote paper in vogue during the 19th century was of such substance that it had to be dampened prior to printing to increase its pliability. The alternate wetting and drying during the various stages of producing currency notes resulted in shrinkage of the sheets. A further disadvantage was that this contraction was not uniform in group lots. Therefore, great care had to be exercised in mechanically separating multisubject work.

The problem was particularly acute in the separation of printings as small as fractional notes. In his search for economical means of producing the currency, it occurred to Spencer Clark that if the notes could be printed dry, the



Hydrostatic pressroom.

shrinkage problem would be eliminated. The idea was not new; it had been tried both in this country and in Europe, without success. Secretary Chase had reservations as to Clark's succeeding where so many others had already failed. Nevertheless, aware of the economies that would result if Clark was successful, Chase authorized him to experiment with the idea. Shortly thereafter a Dr. Stuart Gwynn came to the Department in connection with execution of a contract made with the Government for the manufacture of a special currency paper which he had developed. Gwynn also became fascinated with the potentials of dry printing. Principally at his own personal expense, Gwynn, together with Clark, developed a press operated by hydraulic pressure to print dry work. Their machine printed whole sheets in one fell swoop in contrast to the hand press where an impression was printed by slowly passing a sheet under a pressure roller. The press was the result of prolonged experimentation. The first machines installed were

constantly down for repairs until it was finally determined that the cause was due to faulty metal employed in their construction. Just at the point where success of the project seemed certain, Dr. Gwynn was arrested and imprisoned on charges brought by Lafayette Baker in connection with the procurement of the machinery.

The proposal of dry printing was belittled by Baker in his investigative report. To him the idea was a fantastic hoax. In his opinion the mechanism required for operation of the hydrostatic presses, employing an elaborate series of weights and pulleys, had irreparably damaged the Treasury building and constituted an "imminent peril to . . . the lives and persons of the employes of the department." Since Baker's charges could not be substantiated, Gwynn was released after being held for 1 month in the Old Capitol Prison of Civil War notoriety. Disgusted by the treatment and since redress was not forthcoming, Gwynn cut off all personal relations with the De-

partment. Clark continued the experiments alone and brought them to a successful conclusion. On June 3, 1864, Secretary Chase wrote that hydrostatic presses "are now in daily use, producing dry-printed impressions of unexcelled perfection and beauty."

With such an endorsement it seems strange that use of the equipment was not expanded. It appears that production from these presses was confined to that of fractional currency. Use of the presses was discontinued in 1869 for a now undeterminable reason. Clark severed his connections with the Department that same year. Chief Irish in his 1880 history makes only a brief mention of dry

printing. He draws the curtain on the subject in these words:

Upon his [Clark's] retirement, however, a return to the use of hand roller presses was made by his successor and the plate printing of the Bureau since 1869 to the present time has been executed by that process, with the exception of some work performed during the past two years by steam plate printing presses.

It is extremely fitting that today the Bureau is printing approximately 50 percent of its currency by dry printing. Although the present-day method is based on an entirely different principle of press operation, Spencer Clark stands vindicated in his efforts to introduce the best equipment that could possibly be devised for printing U.S. paper money.

CHAPTER II Growing

Pains—a name of its own

1868 – 1879

THE WORK OF SEALING, trimming, and separating the \$1 and \$2 Treasury notes begun in the Department in the late summer of 1862 was not given corporate form at that time. This is understandable since the letter of August 22, 1862, placing Spencer M. Clark in charge of the operations specifically stated that the work was being undertaken on a trial basis and that if the new procedure did not prove to be more economical and better than the method previously employed, it would be discontinued. Even after a successful trial period and the subsequent assigning of the processing of all denominations of currency to Clark's jurisdiction, no action was taken to set up a formal organizational component within the Department to handle the functions. Apparently, the work was regarded as being directly attached to the Secretary's office.

The unit performing this work was referred to by a variety of titles. Early records make reference first to the "Small Note Department," "Small Note Bureau," "Small Note Room," "Note Bureau," and later to the "National Note Bureau." Evidently, this last name was given some formal acceptance, for there is in existence today correspondence addressed to various Treasury Department officials by Clark on official engraved stationery bearing that title.

The first mention of the organization

in the *Official Register of the United States* is found in the 1863 edition, where it is listed as the "First Division of the National Currency Bureau." That Bureau, now the Office of the Comptroller of the Currency, came into being as a result of the passage of an act of February 25, 1863 (12 Stat. 665), ". . . to provide a national Currency, secured by a Pledge of United States Stocks, and to provide for the Circulation and Redemption thereof."

In his book *Men and Measures of Half*

a Century, Hugh McCulloch, the first Comptroller of the Currency, states that he came to Washington in the spring of 1863 for the purpose of establishing the National Currency Bureau.

Just when the first division of that Bureau was formed with Spencer Clark as its head is uncertain. The earliest evidence that could be found relating to the use of the name "National Currency Bureau" in reference to the printing of paper money is a copy of a letter from Secretary Chase to the Continental Bank Note Co., dated July 20, 1863. On July 31 of that year, Clark wrote to a Charles C. Edwins of Brooklyn, N.Y., and signed the letter as "Chief 1st Division National Currency Bureau." A report prepared in October 1867 for the Joint-Select Committee on Retrenchment relative to the cost of operating the "Printing Division" since its organization states:

. . . this division was not organized, in form, until sometime in the winter of 1862-63, but expenses were incurred, with a view of its organization, as early as April 1862.

The assigning of the currency production operations to the National Currency Bureau proved to be fallacious. It was originally contemplated that the printing of national bank notes, or national currency, would be performed at the Treasury Department in conjunction with the production of U.S. notes and other Government securities. However, the idea did not materialize until some 12 years later.¹ Clark attributed responsibility for the change in plan to Comptroller of the Currency McCulloch who had "steadily opposed transferring and printing of the National Currency in the Treasury. . . ."

That the arrangement had no application to fact is brought out in the testimony of Comptroller McCulloch before the 1864 congressional investigating committee. In answer to a request that he give his "views of the Printing bureau, or the printing of the currency at the Treasury Department . . .," he replied:

It is a matter which I have not given special attention to; it is not connected with my bureau directly, and I have given it no personal attention; I do not know that I have any views to express on the subject.

In the same testimony, he stated:

I have nothing to do with the issues of the government; my duties are confined entirely to the national currency.

* * *

I understand that Mr. Clark, head of that division, is nominally in my bureau, but I have never regarded that department as having any legal connexion with mine.

The independent status of the currency printing and processing operations is evidenced by the omission of any reference to these functions in the first annual report of the Comptroller of the Currency, which covered fiscal year 1863. That official lists only six persons as being employed by his Bureau at that time. None of the persons known to have been connected with the early currency production operations are named in this list. In his 1865 report the Comptroller cites the

¹National bank notes were printed exclusively by private contractors until September 1875; thereafter this type currency was partially printed by the Bureau of Engraving and Printing. Beginning in October 1877, the Bureau executed all the work in connection with the printing of national currency.

names of 75 persons as being employed by his organization. In contrast, it is known that in February 1865 there were 527 persons engaged in currency production operations in the Treasury.

In all probability the title "Bureau of Engraving and Printing" originated with Spencer Clark. Like McCulloch, he was cognizant of the fallacy that currency production operations were an organizational part of the Comptroller's office. In his 1864 report, Clark comments:

In my judgment, this Division which now only exists *ex necessitate rei*, should be organized by law as a distinct and separate Bureau, to be entitled "*The Engraving and Printing Bureau of the Treasury Department*."

No action was taken on Clark's recommendation to establish the Bureau as a legal entity. The reason for such an omission can now be but conjectured. Likely, it was an apprehension of losing what was already "in the hand." The Department was on a sound legal basis in printing the currency at the Treasury. But there was the possibility that any effort to obtain legal organizational form for the activity could well result in revocation of that authority.

Various arguments had been advanced as to the impracticality and insecurity of having the Government produce its own currency. The private banknote industry had its champions in Congress and in the Treasury Department as well. Strong political pressure had been brought, and would continue to be brought, with a view toward hampering and curtailing the work of printing Government securities in the Treasury—even toward abandoning the work there entirely. As late as

1877 a bill (H.R. 1808) was introduced in the House of Representatives, which, if it had been enacted into law, would have required all U.S. paper money to be printed by private concerns and "only the sealing, final authentication, and record of the issues . . . be done in the Treasury." The proposal also provided that the force of the Bureau of Engraving and Printing be reduced to a token number of 38 persons and directed the Secretary to sell all the surplus machinery and stock of the Bureau "as thus reorganized."

The first reference on record of the use of the name "Bureau of Engraving and Printing" is found in a copy of an order of July 31, 1868, placed with John R. Hoole & Sons, New York City, for an ornamental strip with that wording, for use in printing a form needed by the Bureau.

A diligent search for definite data as to the date of the adoption of the name has proven fruitless. It can be inferred that it was sometime in mid-September 1868. George B. McCartee, later to be appointed the second Chief of the Bureau, was then serving as acting head of the establishment. Extant records show that prior to September 17 of that year McCartee signed himself as "Acting Chief of Division." Beginning with that date he signed all correspondence as "Acting Chief of Bureau."

Apparently, the new name was slow in taking hold. In testimony given in November 1868 before the congressional joint-select committee in its investigation of the printing of Government securities in the Treasury Department, while some witnesses identified themselves as employees of the Bureau of Engraving and

Printing, many referred to their place of employment merely as the Printing Bureau.

Though there is no specific enabling act establishing the Bureau, its existence had the early approbation of Congress.

The first legislative recognition of the agency, per se, is found in an act of March 3, 1869 (15 Stat. 312), which prohibited any work from being "done in the engraving and printing bureau for private parties." Beginning with the appropriation act of June 20, 1874 (18 Stat. 110), funds were specifically assigned for the operation of the Bureau. Previously, allotments for engraving and printing of currency notes had been made to the Treasury Department without reference to the existence of the printing establishment. Additional organizational recognition was forthcoming in an act of July 11, 1896 (30 Stat. 18), which provided:

That all the business of the Bureau of Engraving and Printing shall be under the immediate control of the director of said Bureau, subject to the direction of the Secretary of the Treasury, and the director of the said Bureau shall report to and be responsible directly to the Secretary of the Treasury.

First International Award

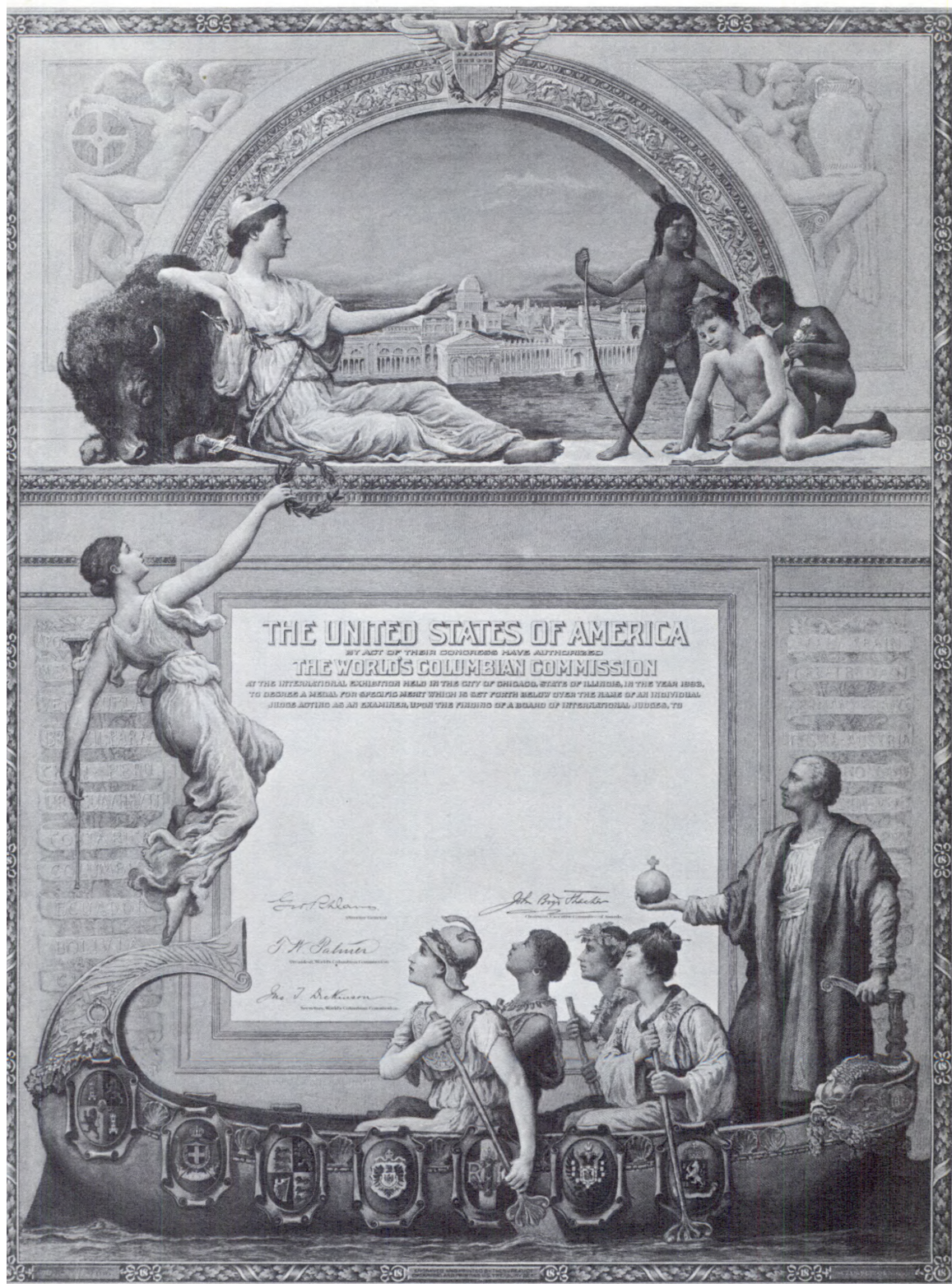
Mid-19th century saw the birth of the international exposition with the open-

ing of the Great Exhibition held in the Crystal Palace at Hyde Park, London, in 1851. So successful was this British innovation that other countries were encouraged to depart from the exclusively national character of their former exhibitions and to welcome displays of the industries of the world.

In 1873 an international exhibition opened in Vienna that far surpassed any other previously held and that was to become renowned for its extent and grandeur. Some 60,000 exhibitors participated, of whom 650 represented the United States. Included among the American entries was a display of engraved portraits and vignettes by the Bureau. Such action on the part of the fledgling organization might have been regarded as a bit brash. Having been engaged in the engraving business but 10 years, here it was, submitting examples of its work in competition with the entries by the long-time masters of the craft of both the Old and New Worlds. Presumptuous or not, the action of the Bureau in placing its work in the competition had to be admired. The daring paid off, for the entry was accorded the exhibition's medal *Dem Verdienste*. This top rank award was given to exhibitors "in consideration of the excellence of the exhibits, the extent of their operations, and the superiority of means and forces employed." It was the first of many to

DIPLOMA, WORLD'S COLUMBIAN EXPOSITION

The Bureau printed 25,000 of these diplomas. The engraving measured 17.5 by 23.5 inches. The Bureau's annual report for fiscal year 1895 said it had been "pronounced by all who have seen it one of the most beautiful and most skillfully executed works of the kind ever issued. It is especially pleasing that this result has been attained, as the diploma will go to all the nations of the world and be subject to the severest criticism."



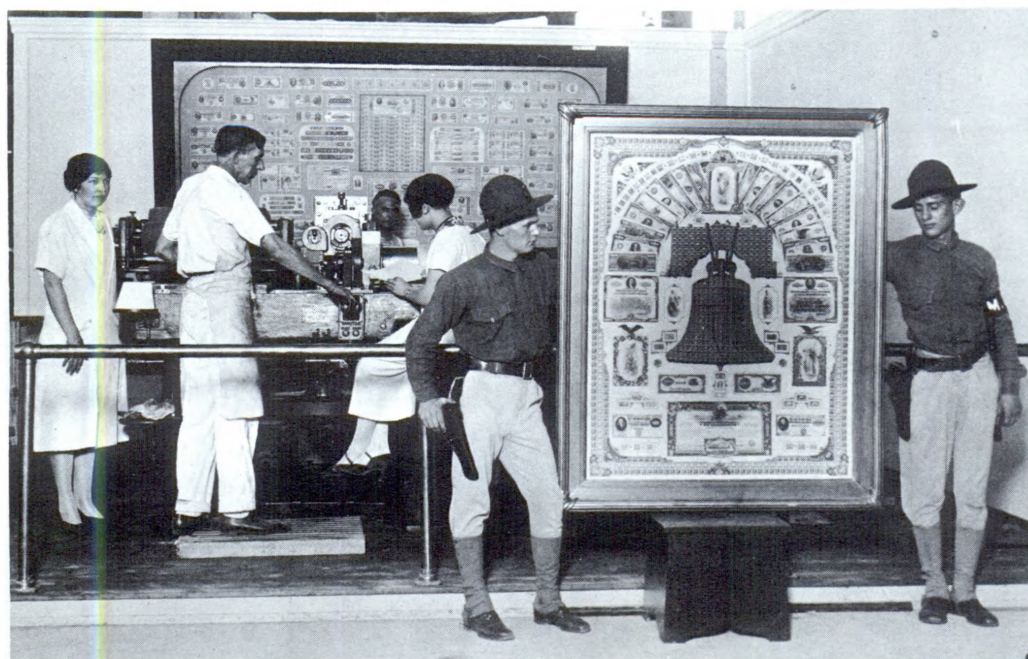
be bestowed upon the Bureau, attesting the skill of execution and the artistic merit of its products. The recognition attached to this award was a point of lively discussion during the hearings held on the aforementioned 1877 House of Representatives bill that would have virtually disbanded the Bureau.

Naturally, the award was of great satisfaction to the Bureau's proponents. It also had another benefit, bringing to a virtual end the charges of inferiority as to the artistic merits of the Bureau's work.

The Vienna accolade was soon to be followed by another. In 1876 the United States sponsored an international exposition in honor of the centennial anniversary of the signing of the Declaration of Independence. The celebration took

place in Philadelphia and comprised a display of immense proportions of the "arts, manufactures, and the products of the soil and mine." A special building was erected to house the U.S. Government exhibits of various functions of the public service. Here the Bureau placed on display a collection of engravings representative of its work. The Bureau was particularly gratified to receive a formal report from the exposition commissioners concerning its display, as follows:

The specimens of engravings exhibited are according to the highest present standard of art in design and execution, and are worthy of the National Institution within which they have been elaborated. The printing is perfectly done, and bears witness to the employment of the best skill and materials, and of highly



The Bureau's exhibit at the National Sesquicentennial Exposition held in Philadelphia in 1926.

improved machinery and process. The whole exhibit is highly meritorious.

The Bureau was awarded the *Diplome d'Honneur*—the highest award for government exhibitions—by the Paris Universal Exposition of 1878; the *Grand Prix* of the Paris Universal Exposition of 1900; the *Grand Prize* of the Alaska-Yukon-Pacific Exposition held in Seattle, Wash., in 1909; and the *Medal of Honor* of the Panama-Pacific International Exposition held in San Francisco in 1915.

In addition to a display of its products, the Bureau's exhibit at the Philadelphia Sesquicentennial Exposition in 1926 included demonstrations of the art of plate printing securities, both on a hand press and a power press. This collective exhibit was awarded the Exposition's *Gold Medal*. The Bureau was awarded the *Diploma de Honor* of the Ibero-American Exposition held at Seville, Spain, in 1929-30.

Internal Revenue Stamps

The same desperate need for Civil War financing which indirectly led to the creation of the component that eventually grew into the Bureau of Engraving and Printing resulted in the formation of the U.S. internal revenue system. Until that time, the National Government relied almost exclusively on tariffs and other customs taxes for its income. An act of July 1, 1862 (12 Stat. 432), authorized the President to appoint a Commissioner of Internal Revenue who was given the authority to assess, levy, and collect taxes and provide stamps "for expressing and denoting the several stamp

duties" imposed by the legislation. This act became the basis of the present internal revenue system, as far as items taxed and organization to collect revenues are concerned. It taxed incomes, estates, public utilities, banks, insurance companies, advertisements, occupations, liquors, tobaccos, and other specified commodities, and provided for stamp taxes on medicines, perfumes, cosmetics, playing cards, and certain commercial papers.

The 1862 act and various subsequent laws provided, in general, for three categories of internal revenue stamps: documentary and proprietary, tax paid, and special tax. Documentary stamps were required to be affixed to such legal instruments as deeds, mortgages, leases, and charters. Proprietary stamps were required for use on specific individual products as purchased by the ultimate consumer. Both of these types of stamps carried denominational values, were gummed, and resembled postage stamps in design and size. Manufacturers of proprietary taxed articles had the privilege of furnishing their own designs for the stamps used on their products, subject to approval by the Commissioner of Internal Revenue. Tax paid stamps indicated that proper tax payment had been made by the manufacturers upon certain commodities in bulk quantity. These were printed in a variety of sizes, usually larger than the customary stamp dimension, were ungummed, and denoted quantity rather than denominational value. They were used for liquors, tobacco products, distilled spirits, and beer. Probably the best known of this category is the once-so-familiar blue cigarette stamp bearing the likeness of DeWitt Clinton



The earliest cigarette stamp portraying DeWitt Clinton was this elaborately engraved item of 1878. Although the portrait was probably the most widely reproduced in the world, the reason for its choice is obscure. It is assumed that the 1876 50th anniversary celebration of the opening of the Erie Canal was the influencing factor, since Clinton had been an ardent champion of the building of the canal.

in the classic finger-to-temple pose. From 1878 until the item was discontinued in June 1959, that portrait appeared on more than 490 billion packs of cigarettes. Special tax stamps emanated for the most part from regulatory legislation. They were in effect a license to engage in business and were used as a means of control over manufacturers, dealers, and peddlers of certain commodities, and proprietors of places of specific amusements.



The offset printed stamp used on the standard-size pack of cigarettes at the time this revenue item was discontinued in 1959. Cigarette stamps were one of the earliest jobs printed on offset presses by the Bureau.

The stamp itself resembled a license or certificate in format and was usually required to be posted conspicuously at the place of business.

Though the bulk of the printing of the first U.S. revenue stamps was assigned to private banknote firms, the Bureau was printing beer and cigar stamps as early as 1867. The next few years saw an increase in the number of revenue stamps printed and processed by the Bureau. The Chief's annual report for fiscal year 1870 indicated deliveries of 31 million stamps embracing distilled spirits, beer, tobacco, custom cigars, and special tax stamps. By 1873 deliveries had risen

to over 224 million stamps and the categories expanded to include distilled spirits for exportation, compound liquor, cigar and cigarette, and snuff stamps. Most of the work reverted to private banknote companies by 1875 since their bids for producing a variety of the stamps were less than those of the Bureau, which continued to print only the custom cigar and special tax stamps. An act appropriating funds for Government expenses for fiscal year 1877 (19 Stat. 152) required that internal revenue stamps should be printed in the Bureau, provided that the cost did not exceed that paid under existing contracts to private banknote companies. However, the Secretary of the Treasury felt that the Bureau would be unable to compete with the private firms, and it was not until the following year, under a new Secretary, that the Bureau resumed manufacture of almost all the internal revenue items. The printing of proprietary and documentary stamps was transferred to the Bureau in 1880, but the legal requirements for these stamps were soon canceled. Certain stamps were authorized in the following years: oleomargarine stamps were introduced in 1886, and playing-card stamps were revived in 1894. When new financing became necessary because of the Spanish-American War in 1898, proprietary and documentary stamps were reintroduced. In that year the Bureau printed approximately 1 billion revenue stamps. Since the demands for stamps were so great and so many varieties of securities were required from the Bureau at the same time, the Commissioner of Internal Revenue was "authorized to procure any of the stamps . . .



The first U.S. commemorative revenue issue was this 10-cent documentary stamp marking the hundredth anniversary of the Internal Revenue Service on July 1, 1962. Designed, engraved, and printed at the Bureau, it pictures the present Internal Revenue headquarters.

by contract whenever such stamps can not be speedily prepared by the Bureau of Engraving and Printing; . . .” This authorization proved unnecessary, as all internal revenue requirements were filled by the Bureau at that time. The authorization was renewed in the following year (30 Stat. 1090) and the Commissioner has ever since had this prerogative in the placement of stamp orders.

In 1902, many of the laws calling for specific internal revenue stamps were repealed, but the Bureau continued to print great quantities of the stamps that remained in effect. As an example, in 1907 there were 2½ billion revenue stamps delivered, including those for distilled spirits, rectified spirits, liquor dealers, oleomargarine, snuff, cigars, cigarettes, flour, wine, denatured alcohol, beer, and playing cards. The use of proprietary stamps was renewed during the preparedness period preceding World War I and was continued into 1922.

Aside from the staggering amount of revenue stamps manufactured in the Bureau, a further significance of these items

derives from the part they played in the introduction of improved machines and processes employed by the Bureau. The tremendous stamp requirements not only contributed to the introduction of the power plate printing presses in 1878 but spurred the improvements made to this type equipment during the period of its original use by the Bureau. The need for additional revenue items was also responsible for the extended use of typographic printing made in 1890 and of off-set printing made in 1914.

Although many internal revenue items have been discontinued in recent years, the Bureau delivered more than 2 billion revenue stamps during fiscal year 1962.

Power Plate Printing Presses

On August 1, 1876, James Milligan of Brooklyn, N.Y., was granted U.S. Patent No. 180,490 for an "improvement in plate printing presses." The invention was to revolutionize the engraved printing industry. Use of the new press by the Bureau was to entail extended and careful evaluation. W. J. Gibson, attorney for the owners of the press, well described this effort in a statement before the Senate Committee on Finance, in 1889, when he said:

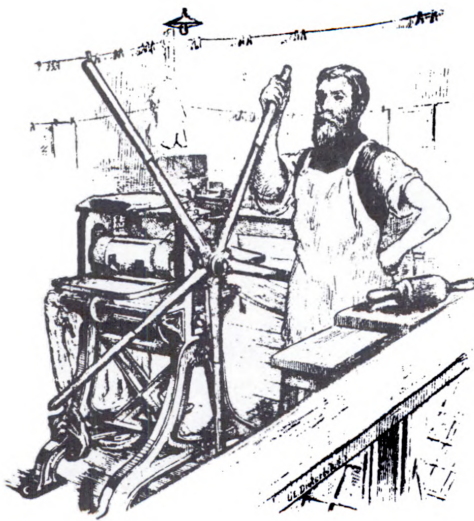
The Government probably never exercised greater care and deliberation about the introduction of any machinery into its work than it did with respect to these Milligan power plate-presses.

Once the press was introduced into Bureau operations, the effort put forth in evaluating it was matched only by the persistency displayed against the constant

onslaught of organized resistance to full use of the press.

Milligan was a "practical plate printer by trade" ² and was, therefore, familiar with the arduous physical effort entailed in the operation of the single-plate hand roller press then in vogue. This press with its long radial handles called a "spider" was a relatively simple mechanism. In addition to its iron framework, it consisted of a plank or bed, also of iron, which moved between two steel rollers, the top one of which was covered with felt to soften the pressure. The engraved plate had to be heated on a small stove and the printer had to vigorously roll the ink onto the plate with a leather or rubber roller. The heat and rolling action caused the ink to penetrate the lines of the engraving. Next, the surplus ink lying on the surface of the plate had to be removed by a brisk rubbing with a piece of starched muslin. In order to clean the plate perfectly, the printer then had to polish it with the palms of his hands. This polishing required skill and judgment, for every trace of ink had to be removed from the surface of the plate without disturbing the ink that lay in the engraved lines. The printer then transferred the plate to the bed of the press, and his assistant laid a dampened sheet of paper upon the plate. Grasping the spokes of the "spider" in a hand-over-hand action, the printer forced the bed and plate between the rollers. His assistant removed the sheet and set it aside. After the backs were printed, they were

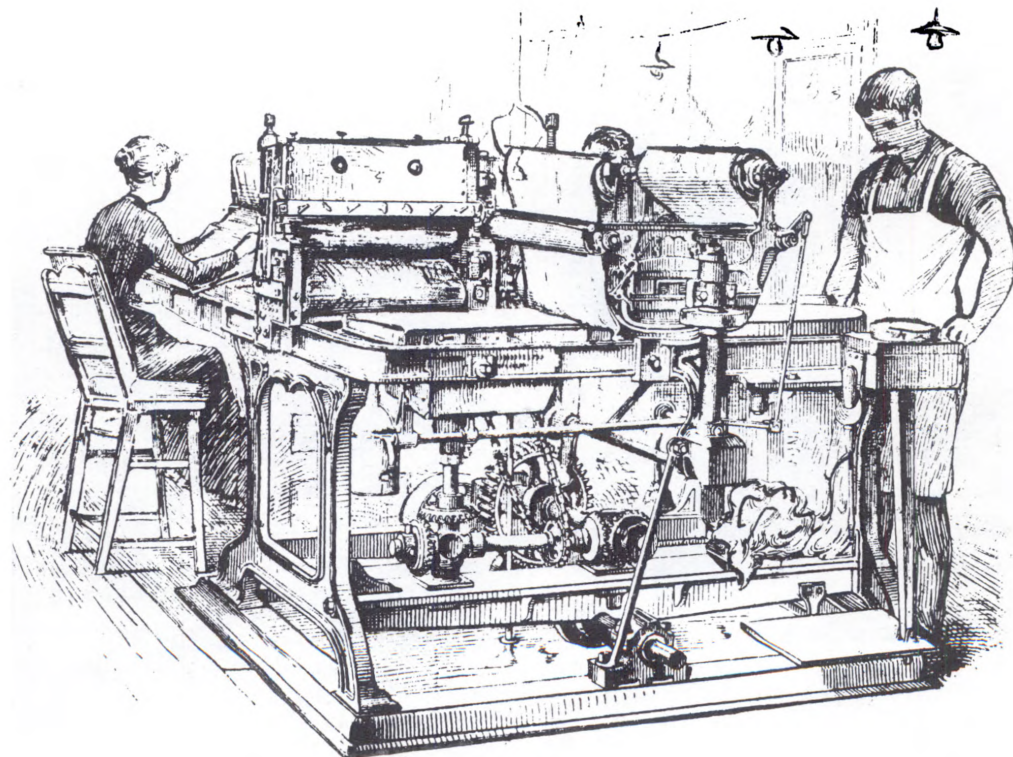
² Milligan later served as a foreman plate printer in the Bureau. He died in 1884, leaving his interest in the press to his wife and daughter.



Hand printing press.

dried; then the sheets were rewet and the faces printed in the same manner.

Milligan's press, which incorporated the basic principles of the hand press, was powered by steam and performed the printing, inking, and wiping simultaneously through the continuous movement of four plates around a square frame. The printer made the final polish by hand and his assistant placed the sheet on a moving plate which was engraved with register markings for proper positioning of the paper. After the impression was printed by movement of the plate between a set of pressure rollers, a second assistant removed the sheet and the plate continued onto another cycle. The mech-



Steam printing press.

648-001 O-64-4

anization of three of the functions formerly performed by the printer naturally increased the productive output over that of the hand press.

At the request of Secretary of the Treasury John Sherman, Milligan brought his press to Washington for the purpose of having it evaluated by a committee of experts for possible use by the Government. Testing of the machine began in May 1877. The committee appointed by the Secretary reported that "There are certain classes of work which might be satisfactorily printed upon the press with more economy and more rapidity than by hand-press." Accordingly, the press was introduced into the Bureau in January 1878. It would appear that this machine was procured for extended practical trial purposes, for Milligan did not consider his press as being in full operation until the following August 1. Meanwhile, another type of steam press, the Neale-Appleton, which did not require the services of a plate printer, was evaluated by the Bureau. The following December the Secretary appointed another committee "to examine and report upon the merits of the two [types of] machines" That group was composed of Representative Hiram P. Bell, a member of the House Committee on Banking and Currency, as chairman, and "four experts from the Treasury Department."

"After a very careful, patient, and as thorough an examination as practicable, . . ." the committee concluded that the steam presses did not "attain as high a standard as that done by the hand-roller presses." However, in their opinion the presses were suitable for printing certain

classes of work in a satisfactory manner with a considerable savings to the Government (the Milligan type more so than the other) and it was suggested that "it might be to the advantage of the Government to procure a limited number of the steam-presses under consideration," Accordingly, a proposal was made to the owners of the presses to permit the Bureau to retain the experimental models and to construct 5 additional machines of each type at \$500 per press and a royalty of \$1 for each 1,000 impressions printed. The proposition was accepted by the owners of the Milligan patent and in January 1880 a contract was entered into under the "expressed agreement that the right to make and use these presses was for the purpose of a more thorough test of the adaptability of the press to the work of the Government." Owing to disharmony between the owners of the Neale-Appleton press, the proposition was not accepted by them and, consequently, no further use was made by the Bureau of that machine.

In August 1881 tests were begun on a third type steam press, the Homer Lee.³ Like the second machine tested, it did not require the services of a plate printer.⁴ Almost a year later a committee of seven persons, two of whom were from the Bureau, was appointed by Secretary of the Treasury Charles J. Folger to consider the relative merits of the Homer Lee, the

³ A pamphlet written in 1889 about the Milligan press states that the Homer Lee was a French product, known as the "Guy Press."

⁴ These machines needed only the attention of a pressman to adjust them and keep them in running order.

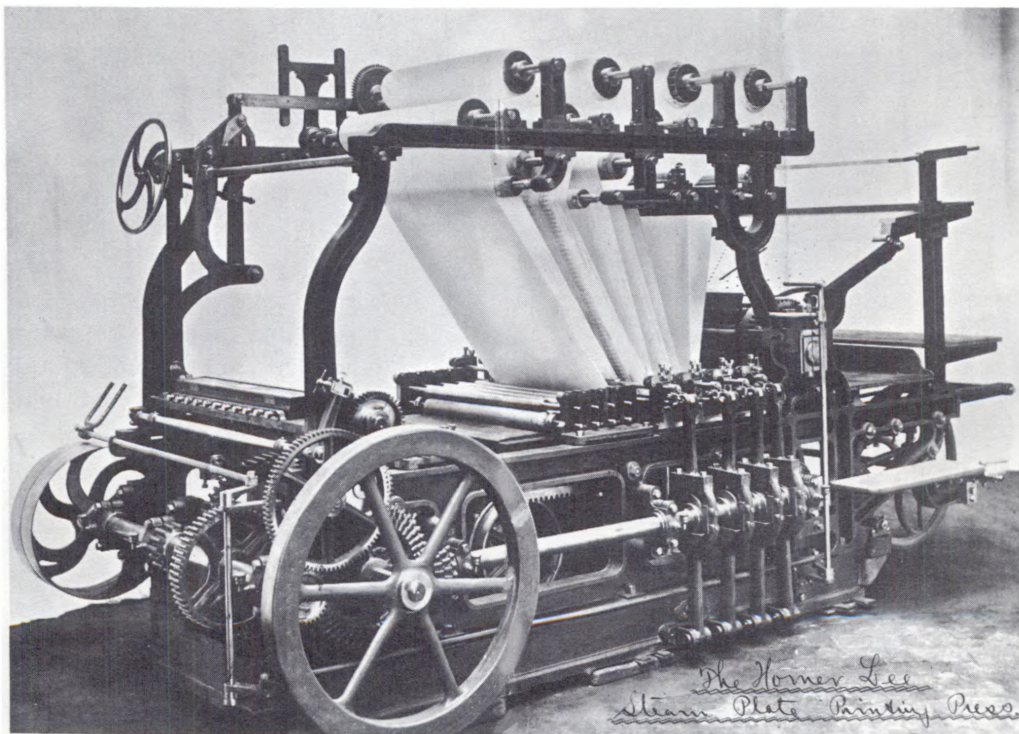
Milligan, and the hand press. After a 10-month investigation, the full committee found that the Milligan could "print certain classes of securities with an acceptable degree of excellence," but the members were split 5 to 2 as to the potentials of the Homer Lee press for printing work of a higher standard than that which the Milligan press was capable of producing. The committee majority concluded that—

... the steam-power presses can execute the securities for which they are adapted at less expense than the hand-presses, and that the Homer Lee press can execute the same work at less expense than the Milligan press.

... it is for the interest of the Government to discontinue the use of the hand-presses for printing those securities which

it has been found can be printed with greater economy by the steam-power presses, and to use such a number of Homer Lee presses as will accomplish the printing of the securities for which it is adapted.

Accordingly, the Secretary directed that the Bureau acquire the experimental model and three other Lee presses. The Chief of the Bureau felt that such a move would be a false economy and recommended that no additional Lee presses be introduced. Apparently, this recommendation did not prevail and an effort was made to procure the machines but without success. In an 1885 report on the matter, the succeeding Chief stated that "for some unexplained reason, the owners of the patent declined



The Homer Lee—the automated plate printing press of its day.

to furnish the presses.”⁵ Subsequently, the Bureau arranged for the construction of six Milligan presses of an improved pattern and all were in operation by January 1887.

Previously, production on the steam plate presses had been confined to printing 2- and 4-ounce tobacco stamps and the green backs of some U.S. notes. Upon acquisition of the additional machines, power press production was expanded to include that of backs for the \$1 to \$10 silver certificates and the \$10 and \$20 U.S. notes. Early in fiscal year 1888 it was found that the Bureau could not meet production requirements, because of the legal provision granting all Bureau employees 15 days absence (24 Stat. 607), effective July 1, 1887, and the unprecedented demand for tobacco, cigar, and cigarette stamps. In consequence, the number of Milligan presses was further increased to 18.

These latest acquired presses were assigned to the production of 50-cigar stamps. This innovation illustrated the progress made in the improvement of steam press equipment. It was described as follows:

The 50-cigar stamps are printed in black ink, which is more difficult to work than the green ink used on the other securities printed by the steam presses, and therefore they do not come quite up to the same standard of excellence as the other

securities printed by this process. They do, however, compare favorably with much of the printing of the same class done on hand-presses. Their quality has steadily improved since the first attempt to print them by steam, and there is no doubt that with added experience it will still further improve.

The extent to which steam presses were being used is recounted in the Bureau's annual report for fiscal year 1888, which reads:

The steam-presses are now printing much more than one-third of the work of the Bureau with a great economy of room, labor, and expense. The cost of the printing done by them is less than \$80,000. To print the same work by hand would cost \$180,000,

This broadening application of the presses was too much for the plate printers. They saw it as yet another encroachment into the once exclusive realm of the hand press. How far away was the printing of black internal revenue stamps from the printing of black faces of currency notes? The printers were concerned that they might be thrown out of work. Further, they were convinced that only through use of hand roller presses was it possible to achieve the best quality work so essential as a definite check to successful counterfeiting.

The heretofore token opposition to the use of power plate printing presses in the Bureau took on added impetus. The Knights of Labor of North America in a general assembly held at Minneapolis, Minn., in October 1887 adopted a resolution demanding that “all Government securities, notes, bonds, checks, and stamps shall be printed in the highest style of the art of plate printing, from

⁵ A possible clue to the firm's refusal to negotiate is found in the 1889 Milligan press pamphlet which stated that the Homer Lee press was then “owned by a private bank note company and its further use cannot be had by the Government.” It could well be that the exclusive rights to the press were being transferred to that company in 1885.

hand-roller presses” Further, the assembly directed that any group or person appointed to represent the union before Congress do everything “practicable to give effect to this resolution.” Organized labor was not satisfied even with the extent of this measure, for it vigorously backed a bill introduced in the Senate in January of the following year that not only provided that all Government securities be printed on hand roller presses but also required that the Chief and the Assistant Chief of the Bureau be practical engravers or plate printers.

Though that bill never became law, the opposition was greatly heartened by the provision of the Sundry Civil Act for fiscal year 1889 (25 Stat. 511) which prohibited any increase in the number of steam plate printing presses used in the Bureau. The appropriation act for the following fiscal year (25 Stat. 945) likewise legislated against any increase in the number of steam presses and contained an additional provision as follows:

That unless the patentees of said steam presses shall accept the five hundred dollars already paid as a royalty on each press and the rate [of one cent] per thousand sheets herein provided the said presses shall not be used by the Government after the close of the present fiscal year [1889].

That proviso sealed the doom for the time being of the Bureau’s steam plate printing presses. The old royalty had been \$1 per thousand sheets and the holders of the patent rights declined to accept the drastically reduced rate. Consequently, use of the equipment was discontinued after June 30, 1889.

Distinctive Currency Paper

The use of a distinctively marked paper in printing currency notes, limited by law to this single purpose, was early recognized as one of the prime deterrents to counterfeiting.

Spencer Clark reported that he had frequently recommended to the Secretary “the propriety and economy of manufacturing paper of a distinctive character in the Department.” In 1862 he was authorized by Secretary Chase “to make investigations and experiments in reference to the manufacture of a distinctive paper in the [Treasury] building.” In connection with this assignment, he reported:

I labored at this as time and opportunity allowed, and received much aid and many suggestions from different experts, to whom I communicated my views. We attempted to produce a paper evenly tinted in the fibre with a bright non-photographic tint, which would not interfere with the engraving, and could not be removed from the paper without destroying the fabric, and which would at a glance distinguish the Government issues from all other. All our efforts failed to produce this desideratum. We could introduce no suitable pigment which we could not chemically remove.

Meanwhile, the Department issued an advertisement inviting proposals from manufacturers to furnish paper for use in the printing of U.S. securities. In answer thereto, Stuart Gwynn of Boston, Mass., submitted “samples of most extraordinary character and excellence” of a vegetable membrane paper of his invention. In Clark’s opinion, “The ‘distinctive mark’ submitted by Mr. Gwynn . . . [was] ingenious, and might

be serviceable to the Department in detecting counterfeits." After some delay, a contract was entered into between the Secretary and Gwynn on October 13, 1862, for the production of the unique paper in the Treasury Department.

Some of the interesting features of this contract were:

The Treasury Department had the exclusive right to manufacture and use the paper.

The "secret" or process of manufacture was not to be divulged to any person whatsoever except to those immediately engaged in its manufacture in the Treasury building.

Gwynn was required to superintend the construction of the necessary machinery for the manufacture of the paper.

A secret mark "of such size and device as may be directed by the Secretary" had to be placed in the web of the paper "so that one copy, or impression thereof, shall be upon each note or stamp issued, . . ."

Upon coming to the Department, Gwynn devoted his first attention to tinting the fiber of the paper to be made under his contract. A report describing these experiments and the success achieved in this regard states:

He [Gwynn] made extensive experiments, but with all his scientific knowledge failed to produce an even non-photographic tint which that same scientific knowledge could not effectually remove. In the course of his experiments he discovered a method of tinting non-photographically, with a new and rare pigment, a fibre foreign to that used in the manufacture of paper, but which could be introduced into and mingled with it in such a manner that no re-agent known to chemistry, nor any method that he could devise, would remove its non-photographic property without at the same time removing the fibre itself. This was

the origin of the so-called "spider-legs" in the membrane paper, and which has been adopted as one of the distinctive characteristics of the National Paper now [1864] made in the Department.

* * *

The first membrane paper produced was unsatisfactory. The peculiar process of making, rendered it more liable to split than ordinary bank note paper. . . . But experiments were immediately made to overcome this difficulty, and ultimately with entire success. He now produces a paper under his contract which cannot be dissolved in hot or cold water, which cannot be split, which has an irremovable non-photographic tint in its spider-leg fibre, and which takes ink more readily, retains it longer, and wears better than any paper heretofore manufactured for the purposes of currency in any country.

Thus the Government acquired its first distinctive paper for currency. It was originally contemplated that the paper would be used for all issues of notes. With this intent in mind, Secretary Chase had legislation passed which made it unlawful for anyone, except by special authority, to possess a paper similar to that used for currency after it had been adopted as a distinctive item by the Government (13 Stat. 222).⁶ However, the paper had been applied only in the production of fractional currency when some difficulty arose between the Treasury and the supplier of the basic paper stock used⁷ and manufacture of the spider-leg

⁶ A similar restriction is in effect today: 18 U.S.C. 474.

⁷ From meager data available, it appears that Gwynn's process involved the introduction of tinted fibers between two sheets of specially premanufactured paper stock which were chemically treated and pressed together to form a single print-sheet.

paper was temporarily discontinued. Meanwhile, Gwynn was imprisoned on charges of defrauding the Government, brought by Lafayette Baker, which were later proven unfounded. Failing to receive vindication for this embarrassment, Gwynn disassociated himself from the project, leaving the execution of his contract to a subordinate and an attorney. Apparently, without his personal direction, the manufacture of the spider-leg paper lagged and was soon discontinued.

A distinctive paper for currency was not again used until 1869. On March 31 of that year, Secretary of the Treasury George S. Boutwell entered into a contract with Messrs. J. M. Willcox & Co., of Philadelphia, for the manufacture of a paper for use in printing fractional currency and U.S. notes. The contract specified that there would be introduced into the paper "silk fiber of two different colors, . . . and also a watermark showing repeatedly, as may be thought advisable hereafter, the letters 'U.S.'." From an explanation found in the report of a committee appointed by the Secretary of the Treasury in 1877 to make an examination of the Bureau, it would appear that the product manufactured under this original contract contained distinctive fibers of only one color—short, red silk—rather than the two called for by the specifications. The group also reported that this paper was "used to some extent in the printing of Fractional currency, but was never used for United States notes."

The contract remained in effect only 6 months, for in September 1869 the Treasury entered into agreement with the Willcox firm whereby all the paper

intended for use in printing of currency, bonds, and notes would embody the distributed fiber feature and the "U.S." watermark and, in addition, the paper intended for legal tender issues (U.S. notes) would include a newly invented localized fiber feature. The patent for the latter was held by the Willcox firm, the special characteristic being a "band or bands of dark-blue jute fibre, two or three inches in width, traversing one face of the sheet[s]." ⁸ Willcox continued to manufacture this paper for the Government until August 31, 1877, when it was felt that there were sufficient stocks on hand to meet requirements for a considerable period and all agreements were canceled.

When additional stocks were next needed, Willcox refused to make available data upon which a "just and equitable price" for the paper could be adjudged; therefore, the Secretary issued a general advertisement soliciting proposals for furnishing a distinctive paper to the Department. On the basis of the bids received, the contract was awarded in June 1879 to Crane & Co., of Dalton, Mass. That firm furnished a paper comprised "of pure linen stock, with continuous colored [red and blue] silk lines or threads running parallel to each other from the top to the bottom of each sheet, or from side to side, as the case might be; and in addition thereto, colored [red and blue] silk fibers were introduced into the pulp from which the paper was made,"

⁸ Actual experience proved the use of this jute paper to be impractical for securities where signatures or endorsements had to be handwritten.

In 1885 the practice of incorporating distributed fiber into the paper during the course of manufacture was discontinued, but the security feature of localized fibers remained in effect. A public notice issued by the Secretary of the Treasury dated June 10, 1885, advising the public of the adoption of the distinctive paper described the item as follows:

The paper for United States notes, national-bank notes, and certificates is a white bank-note paper, glazed on both sides, and its distinctive feature is the introduction of a blue silk thread into the body of the paper . . . , which shall run lengthwise through each note or certificate.

Actually, the distinctive feature comprised eight threads to a sheet or two to a note, approximately an inch in length, located in an irregular manner on the right and left sides of the note. In August of 1886 this requirement was reduced to one blue thread to "appear near the center of each note." The following year the use of two threads for each note was resumed and this type paper remained in effect until 1891. In July of that year the requirement was changed to read:

The paper for United States notes, national-bank notes, and certificates is a cream-white bank-note paper. Its distinctive feature consists of localized red and blue silk fiber incorporated in the body of the paper while in the process of manufacture, so placed as to form a perpendicular stripe on either side of the center portrait or vignette of each note and other obligation.

No change was made in the distinctive feature of the paper until the introduction of small-sized currency notes in 1929 when the localized feature was discon-

tinued and replaced by small distributed red and blue silk fibers dispersed throughout the sheets. However, there had been changes made in the basic rag content of the paper during that interim.

Owing to the conditions brought about by the outbreak of war in Europe in 1914, Great Britain placed an embargo on the export of linen cuttings. As a result, the distinctive paper contractor was unable to secure adequate stocks of such cuttings, which were employed in the manufacture of the currency paper. Consequently, by the fall of that year the Treasury Department authorized the contractor to substitute cotton in place of one-third of the linen formerly used. As hostilities increased, a reduction to 50 percent in the linen content became necessary as of January 1, 1917, and by the end of July of that year this ingredient had to be reduced to 25 percent. By the close of 1917, the world supply of linen available for nondefense purposes was such that the Government had to resort to the use of a paper made entirely of cotton. This was used until March 1921 when the supply of linen on the market was sufficient to warrant restoration of the 50-percent formula. In July 1922, the linen content was further increased to 75 percent and then to 100 percent by the following spring.

Experience showed, however, that this all linen paper was not as satisfactory, from the standpoint of printing and wearing qualities, as that made with one-quarter cotton. In view of this finding, a return to the stock formula of 75 percent linen and 25 percent cotton was authorized in September 1924. This 3-to-1

ratio was maintained until shortly prior to America's entry into World War II.

Fortunately, during the Second War period it was never necessary to alter the basic linen and cotton formula to lower than a 50-50 ratio. The difficulty this time concerned finding suitable replacements for the silk fibers used as the distinctive identifying feature in currency paper. The world supply of silk was so adversely affected that in April 1942 nylon fibers were substituted in the manufacture of the paper. By April 1943 nylon was in critically short supply and the Government had to resort to colored cotton thread for the protective feature. This type thread continued to be used until it was replaced by another synthetic fiber in 1950.

The numerous technological advancements in paper manufacturing achieved during and immediately after the war, which resulted in a much stronger and longer wearing product, obviated any necessity for the Bureau to return to a higher linen content paper than the 50-percent type. In fact, with the introduction of dry printing of currency in 1957 the linen content of the paper for the

notes was further reduced to 25 percent.

It is interesting to note that the Crane company has continued to supply the distinctive paper used in the printing of currency from 1879 to date. From time to time the Bureau has cooperated with other paper manufacturers who have expressed an interest in supplying a special paper for the purpose. In furtherance of this end, the Treasury Department negotiated "educational" contracts with another manufacturer in 1928, 1930, 1934, and 1935 to supply small amounts of the total distinctive paper requirements. However, on each of these occasions the product furnished was found to be unsatisfactory. Invitations to bid on the paper contract have been extended each year to all known rag-paper manufacturers throughout the country.

To encourage competition in the manufacture of distinctive paper for U.S. securities, Congress, in 1932, authorized the Secretary of the Treasury to split the award for such paper between two bidders whose prices per pound were the lowest received after advertisement (47 Stat. 583), and this authority remains in effect today (31 U.S.C. 418a).

CHAPTER III The Bureau Comes of Age — a home of its own 1880–1893

A SCANT 3 YEARS after beginning operations, Spencer Clark made a formal recommendation to the Secretary of the Treasury that separate facilities be provided for the printing and processing of the currency. The scope of the work then performed can be gaged by his report of the same time wherein he stated that a “total of three hundred and twenty-four engines, machines, &c.” were in use and there were employed “in connection with this machinery, 237 male and 288 female operatives;” The physical facilities for performing the work were anything but ideal, being divided between the basement and the attic of the Treasury building and requiring the use of a dumbwaiter to transport the paper and printed securities between the two locations.

It was Clark’s recommendation that—
The work should all be executed in a fire-proof building, to be erected and exclusively occupied for this purpose. A substantial but not costly structure should be built on the grounds adjacent to the Treasury Building, and communication between it and the room occupied by the Treasurer of the United States should be made by a subterranean passage between the two buildings through which the printed values could be transmitted, thus avoiding such risk of transmission as attends the present method of carrying

the finished money through the main halls and passages of the Treasury, to which both the public and the Treasury force have free access. The experience of the past two years in this Division, in connection with the detailed descriptions which have been obtained of the construction of the buildings in which the Banks of England and of France prepare and issue their notes, will enable the interior accommodations to be economically and conveniently planned for the safe prosecution of the work, if such a structure be authorized by Congress.

No concrete action was taken concerning Clark's suggestion. Apparently, the situation was still acute in 1868. A special departmental committee, appointed at that time "to examine and report upon the method of business and present condition" of the Bureau, while uncertain that the scope of its assignment called for comment relative to the physical plant, deemed "it better 'to take the responsibility' rather than be recreant to duty." It was the unanimous opinion of the group that—

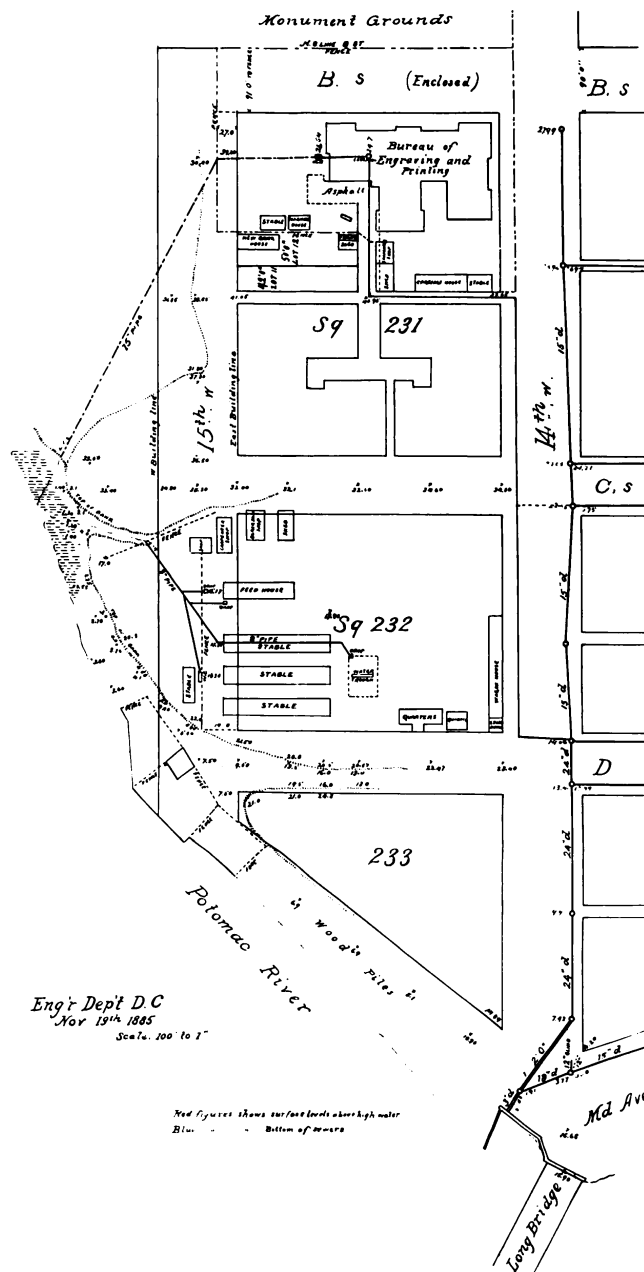
... a separate building should be erected for the accommodation of this bureau, not only on account of its incongruous arrangement, necessitated by its position, but for more safety and convenience, and because of the objectionable interference with other bureaus of the department, by reason of the noise of the machinery and the smoke and soot of the furnaces.

It is likely that the report of a special commission appointed by President Hayes in 1877 to investigate the fire protective conditions of the various Government buildings in the city of Washington did much to stimulate remedying the condition. That group reported that the materials used in connection with the work of the Bureau created a serious hazard in the Treasury building. In view of this stand, the Chief of the Bureau, in his annual report for fiscal year 1877, stated he felt it not "improper" for him "to suggest the expediency of the appropriation by Congress of a sum sufficient to erect, for the purposes of this Bureau, a plain, substantial, fire-proof building, on one of the unappropriated lots convenient to the Treasury Department." Though in full accord

with the commission's findings, the Chief went on to recite "the nature of the precautions taken [by the Bureau] against the occurrence of a fire." These give an excellent picture of conditions at that time.

After working-hours all inflammable substances used in the processes of the Bureau are carefully removed from the building each day. All oiled rags, paper, and other combustible material, are gathered and also removed from the building. A careful watch is kept upon the premises of the Bureau during the entire twenty-four hours. The plate-printers are organized into a fire-brigade, and are drilled every Saturday afternoon; and, a large portion of them being experienced firemen, they constitute a very valuable protection. There are one hundred and forty-five fire-buckets, constantly filled with water, hung in the various rooms occupied by the Bureau. Attachments have been made to the pipes giving the water-supply, which, with a large supply of hose, would give instant access to an endangered point. In addition to this, there will be an attachment made to a large iron tank, now in the process of construction, on the upper floor of the Treasury—all which precautions, it is believed, reduce the risk to a minimum.

It is, nevertheless, conceded that the operations of the Bureau could be carried on with a nearer approach to absolute safety in a building entirely fire-proof. It would also be better that the machinery required for our purposes should be in the basement, rather than in the upper stories of any building, however substantial. The proposed changes would, therefore, not only relieve the Treasury building from whatever strain may be put upon it by the operation of the machinery in use in the Bureau, but it would relieve for other purpose of the Department, the space now occupied by the Bureau. In that event, other bureaus of the Department, now occupying rented buildings,



An 1885 plat showing the site of the first Bureau of Engraving and Printing building. The remaining property in Square 231 was later acquired for expansion of the facilities. The present main building occupies a portion of that land and all the ground dedicated as C and D Streets, between 14th and 15th Streets, as well as the whole of Square 232. It will be noted that at the time of the plat, the Potomac River shoreline abutted Square 233 where now stands the Treasury Department's Liberty Loan Building.

could be brought within the Treasury building and the rentals saved. These rentals, and the economies which, in a new and especially-constructed building, could be introduced into the business, will more than pay the cost of that portion of the building which would be devoted to this use.

The Bureau's plea was seconded by the Secretary of the Treasury in his annual report for 1877.

When serious consideration was first given the matter, it was suggested that the best available location for the new building was a portion of the land owned by the Government lying between 14th and 15th Streets and B Street NW. (now Constitution Avenue) and B Street SW. (now Independence Avenue). The Secretary was of the opinion that the proper site for the building would be at, or near, the corner of 14th and B Streets SW. This would have placed the building in line with the Smithsonian Institution property and the Department of Agriculture grounds.

The Director in writing to the Honorable Justin L. Morrill, chairman of the Senate Committee on Public Buildings and Grounds, in April 1878 stated:

I cannot conceive of any interest which would be injuriously affected by this location [suggested by the Secretary], and it would have the great advantage of avoiding a purchase [of other property] and would secure, at the same time, a commanding situation which would be healthful and give the light needed for our work.

It was initially intended that the building provide space for the storage of the burgeoning records of the Department as well as an assay laboratory for the Bureau of the Mint. Though neither of these

ideas ever materialized, the congressional authorization (20 Stat. 211) for the erection of the Bureau building specifically stated that the structure was also to be devoted "to the mechanical purposes of other bureaus and branches" of the Treasury Department and "to like purposes of bureaus of other departments,"¹

The choice of site was later changed to a parcel of land comprising approximately one-third of the square lying directly south of the Government-owned property originally suggested for the purpose. This land was purchased on June 26, 1878, for a sum slightly in excess of \$27,500, from William W. Corcoran, Washington historical figure and philanthropist, probably best known as the founder of the world-famous Corcoran Gallery of Art.

No time was lost in getting the building underway. A contract for the excavation for the project was awarded the following month. The structure, Romanesque in style, was designed by James G. Hill, Supervising Architect of the Treasury. It was completed in record time at a cost of \$300,000 and was ready for occupancy on July 1, 1880.

A popular Washington guidebook of the day gives a picturesque description of the building:

[It] is 220 ft. long and 135 ft. wide, . . . constructed of pressed bricks, above the basement with string courses of moulded bricks; is fire-proof throughout, the floors

¹ The building was never occupied by any other Government facility until the Bureau moved into its newer building in 1914. Apparently, these clauses were inserted in recognition of the customary Bureau practice of performing services for other Government agencies in its various mechanical shops.



A portion of the Currier & Ives print, "The City of Washington—Birds-eye View from the Potomac Looking North," copyrighted 1880. The Bureau is located in the extreme right foreground.

consisting of iron girders and brick arches, the doors and window frames only being of wood. The *North facade*, facing the city, comprises a basement and three stories, surmounted by an artistic cornice, and broken by three pavilions, that at the N.E., rising into a belfry tower 130 ft. high. The *South facade*, overlooking the Potomac river, is broken by several chimneys of architectural designs. The west carries off the fumes of the hardening rooms, and is built of massive walls to resist the action of the fumes of the acids used in hardening the plates. The *elevator towers* are also of beautiful designs. The *stack* from the boiler rooms in the rear is 100 ft. high.

On the *Principal story* are the *entrance hall* in the belfry tower, lined with ornamental and colored brick, and the stairway of iron and brass railing, with ornamental and enamel brick wainscoting. Nearby are the rooms of the *officer of the watch* and *administrative offices*. On this floor are the vaults, with timelocks of the most delicate mechanism, generally set from 4 p.m. to 7 a.m.; the hardening room, where softened rollers and plates containing the designs are hardened for use by being put into furnaces with heated cyanide of potassium: transfer; geometric lathe; dressing and wash rooms.

The *plate vault*, guarded day and night by trusted watchmen, contains all the engraved plates of the government. The chief custodian is under the Secretary of the Treasury, and delivers plates for printing only upon the Secretary's order, and requires them to be restored at the close of work hours.

In the *basement*, reached from the main hall-way, are clerks' offices; bindery; perforating, gumming, ruling, steam plate press, engine and boiler rooms, and ink mill. There are 8 boilers, 40 H.P. each, and 2 engines 200 H.P. and 60 H.P., and 2 elevators.

In the *sub-basement* are the machine shops for the repair of the machinery used.

On the *second floor* are the draughting, destruction committee, numbering machine, examining, hydraulic press (200 tons pressure) rooms, also the stock vault 65 x 12 ft. of chilled steel and masonry and double doors with time and magnet lock.

On the *third floor*, hand plate press and wetting rooms.

On the *fourth floor* (attic), dressing rooms, males in the E. end and females in the W. end. Also ventilators and fans.

The *tower* is ascended by an iron spiral staircase: in the first landing is the tower clock,² and above, a lookout.

The *boiler house* in the rear, 2 stories high, contains rooms for the destruction of defective bank-notes, furnace room and laundry. The building is heated by hot water, and ventilated by machinery.

On laying out the ground for the new building, it was soon apparent that the site was not large enough, for although the structure was placed close to the B Street property line, there remained but a narrow passageway between the rear of the building and the adjacent privately owned land. Steps were immediately taken to acquire that ground in the north half of the square not owned by the Government, as an addition to the Bureau site for the erection of necessary outbuildings and a passageway to accommodate delivery teams of horses at the rear of the building. An estimate was submitted to Congress for an appropriation for the purchase of the needed land, at a price

² Though the architect's plans called for a tower clock and records of bids for its installation are available, no evidence could be found in support of this statement. Several retired employees who were born and raised in the vicinity have no recollection of such a time-piece nor is any shown in early photographs of the building.

not to exceed 50 cents per square foot. An act, approved June 16, 1880 (21 Stat. 260), provided \$15,732.70 for the purpose. It was claimed that the rate specified in the legislation was the price agreed upon between the agents of the Treasury Department and the owners of the land. However, when the funds actually became available, one of the four property owners concerned declined to sell at the rate set, holding out for a higher price. Since the lot involved was strategically situated, it was impractical to buy all the land that was made available and the Government purchased only the plots bordering on 14th Street.

The opening of the new building brought a complete metamorphosis to the semirural atmosphere of the area. Dirt roadways became cobblestone streets, farm horses were replaced by dray teams, pasture land was developed into city blocks with row houses. Along with these changes, surrounding land values soared. In the years that followed, it became more apparent that the Bureau would eventually require all the property originally sought and it was thought best to purchase the land that was still available at the initially agreed upon price. This land was acquired in June 1886. By the time that it was absolutely essential that the Bureau acquire all the ground originally sought, the asking price for the holdout land had increased to \$17,000, or approximately four times the purchase price authorized by Congress. Finally it became necessary for the Government to institute condemnation proceedings for the land and title was thus acquired by court decree in 1891, at a price of \$15,350.

Meanwhile, the workload of the

Bureau had outgrown the capacity of the building. Contributing much to this predicament were the restrictions imposed by Congress relative to the use of steam power presses as of July 1, 1889, thereby creating an immediate need for some 60-odd hand presses to offset the loss of 19 steam presses; consequently, the already inadequate facilities became exceedingly overcrowded with the additional machines and personnel required by the changeover. As the economic growth of the Nation spiraled, there was a corresponding increase in the demands for more of the Bureau's products, evidenced by the amount of work executed in 1891 which was an increase of 27 percent over shipments made during the previous year. The increase in orders for small denomination currency notes in the spring of 1891 and the steadily rising demand for internal revenue stamps made it apparent that the Bureau's productive output had reached the saturation point. The only way to gain relief was the enlargement of the building. Accordingly, by an act of August 30, 1890 (26 Stat. 374), Congress appropriated \$80,000 for the erection of a wing at the southwest corner of the building. This addition provided 13,000 square feet of workspace.

Further expansion of facilities soon followed. A second extension to accommodate a boiler plant was erected at the rear of the building in 1894. Two additional stories were added to this boilerhouse the following year, and a third story was added in 1896.

By July 1899 the Bureau again reached a crucial point in its need for workspace. Particularly pressing was the need for additional outbuildings to accommodate



An 1895 view of the first Bureau building from the foot of the Washington Monument. On the right is the first addition made to the structure, and in the center, the lofty boiler chimney decoratively capped.

the grinding of dry colors, mixing and grinding of ink, storage of coal, and better stabling facilities.

Because of the lack of space, the Bureau was compelled to mix and grind its ink in the basement and to mix its dry colors in a dark room in the cellar without sunlight or proper ventilation. The dust from the dry colors permeated other parts of the building, fouling the air and discoloring the ceilings. It was felt that the removal of the ink-manufacturing activities to an outbuilding would remedy these difficulties and bring about improvements in the related production processes.

There were no provisions whatever for storing, or even sheltering, the coal used, which approximated some 2,250

tons a year. When delivered, it was dumped in lots of 100 tons at the rear of the building and conveyed, as needed, by wheelbarrow into the boilerroom. The coal lay exposed to the weather, constantly subject to waste caused by the runoff of the rain and melting snow. In the process of being dumped and handled, it gave off a thick dust that floated into the building and seriously interfered with the operation of some of the more delicate machinery.

The stable, wagonhouse, and harness and storage rooms were housed in temporary wooden structures, ill suited for the purpose and not in keeping with the main brick building.

On June 6, 1900, Congress appropri-

ated \$100,000 for the construction of a wing to be attached to the northwest corner of the building and \$115,000 for the erection of the needed fireproof outbuildings (31 Stat. 589). The wing, four stories high, was occupied in December 1900 and the outbuilding accommodating the ink mill, carpenter shop, harness room, stable, and coal storage facilities, which became known as the "South Outbuilding," in January 1902.

In 1903 Congress provided \$215,000 (32 Stat. 1039 and 1211) for the acquisition of additional land south of the Bureau site for the erection of a building to accommodate a new laundry and another stable. The appropriation also provided for the razing of the temporary wooden structures situated along the 15th Street boundary and used to house these two activities to be replaced by the construction of a two-story brick building for the accommodation of security production activities. The new laundry and stable building was completed in August 1904 and the other addition, which came to be known as the "West Outbuilding," by December 1905.

The Bureau continued to occupy this home until 1914 when it moved into new and larger quarters erected on the square immediately south of the old location.

As public buildings go in Washington, the red-brick edifice is not old. At the time of its erection it was regarded as an industrial structure containing the most advanced factory-type facilities. But during the period of its lifetime, vast improvements in the technological fields had occurred and the Bureau's physical plant was soon to become not only overcrowded but outmoded as well.

The Bureau had early been caught in the swell of Washington community life. In a city principally devoted to administrative and clerical work, it was one of the main local industrial plants, along with the Government Printing Office and the Washington Navy Yard. Its ups and downs had impact upon the local economy, especially that of the Southwest wharves and Foggy Bottom areas of the city. To the native population, the term "The Bureau" came to have but one meaning—the Bureau of Engraving and Printing. The "talk of the neighborhood" was the installation of silo-structure fire escapes with circular slides that were the bane of the timorous employee but a joy to the young, as well as those "still young at heart."

During its 34-year tenure, the building saw many changes occur both at the local and national levels. It had been a silent sentinel to the completion of the Washington Monument that opened to visitors in 1888. It had been introduced to the printing of postage stamps in 1894. Within its walls the securities needed for financing the Spanish-American War had been produced. It covetously eyed the building expansion program of the adjacent Department of Agriculture early in the new century. The horsecars that stopped at the Bureau corner to discharge hundreds of passenger-employees had been replaced by electric cars operated on underground cable. The horseless carriages of the day chugged past the Bureau's high-domed windows on a 1905 Sunday outing to test the vehicles' capabilities around the Speedway in the newly created East Potomac Park.

For 8 years, beginning in 1906, Bureau



Life was not all dull at the Bureau. Employees often banded together in planning an outing—as did this group, off for the opening of the 1905 baseball season. The gentleman with the cane is Assistant Director Thomas J. Sullivan.

management was to strive to obtain new plant facilities. Finally, the effort was successful and with the opening of the new building the original main structure was vacated as of April 25, 1914. It was turned over for the use of another branch of the Treasury Department and affectionately became dubbed with the emeritus title, “the old red brick building.”

The 1880 Rule Book

Just as for any family moving into a new home, new rules were established by the Bureau in 1880 “covering its organiza-

tion, accountability for values, and methods of business.” They comprised “such customs and practices as have obtained in the Bureau from its establishment, and which, having been thoroughly tested since its reorganization, are deemed advisable to retain, together with such additions as have been found necessary for the successful operation of the Bureau as a business establishment”

A sociologist would probably regard the book as a good example of the easy pace of living just prior to the turn of the 20th century, reflecting the mores of the times, and pointing out the contrast between management’s problems then and today.

The volume evokes a picture of an era at once quaint and familiar.

For instance, the operation of the Treasury Department was not the diversified and farflung activity that it is today. The Secretary had time to devote his personal attention to each activity under his jurisdiction and—

The Chief of the Bureau of Engraving and Printing makes daily reports to the Secretary of the Treasury of all classes of securities and stamps, showing the receipts, deliveries, and balances on hand by denominations, and carrying the aggregates forward from day to day.

Supplies were tightly conserved; salvaging was a virtue; the guideline was "Waste not, want not," therefore—

Packages must be tied with a slip-knot, and the twine of no package tied in this manner, must be cut.

A dollar went far in those days and brawn had its reward since—

Laborers suited and trained to heavy work [were paid] \$1.50 a day. Laborers unsuited to heavy work; . . . \$1 a day.

The use of nicknames like Bridie and Barney, Lizzie and Len, Maggie and Moe were taboo and the timeclerks were required to take—

care . . . that the proper, not the familiar, names of all employes are entered [on the work records].

Children started work at an early age—child labor laws were few. The regulations regarding young employees required that—

Boys employed in the Bureau must present the written request of their parents or guardians before they can obtain advance on their pay.

Boys . . . absent for one day without leave, will not be permitted to return to work unless they present, in writing, from

their parents or guardians, a good and sufficient excuse for the absence.

The conveniences taken so much for granted today were valuable innovations in 1880, and their use was largely restricted since—

No employé will be allowed to use either of the elevators except upon the special permission of the Chief of the Bureau.

The use of . . . [telephone] instruments is restricted by contract to Department business. To insure that the contract is not violated, all messages must be sent through or received by the office of the Chief, Assistant Chief, or the Accountant, or by persons attached to their respective offices, acting under their direction.

Fire was a constantly lurking enemy and air conditioning a thing yet undreamed of. The specific duties of the Bureau watchmen required that—

. . . they will make a special examination of all gas-fixtures, and see that no gas is escaping, . . . that no combustible material is left in any of the rooms, and that no fire is smouldering.

It shall be the duty of the watch-force to see that the water-pipes and hose provided for use in case of fire are constantly in good working order, and that an ample supply of water-buckets are kept filled with water.

The watchmen on the second relief [which started work at 7 a.m.] are charged with seeing that all doors and windows throughout the building are opened. No window must be opened in the morning to admit the outer air until the sun is well up.

There were no automatic washers and dryers, nor a Laundromat in every other city block. The rules remind us that it was a time when personal hygiene made the bath a Saturday night ritual for—



Practically from its very first days, "boys" were employed as apprentices in the various trades in the Bureau. The solemn young men in this 1912 picture were members of a committee which arranged for a Thanksgiving Day dance for the plate printer apprentice force.

Employés of the printing division will be required to change working-clothes once a week as far as practicable.

The Superintendent of the plate branch is instructed to refuse a plate on Monday morning of each week to any printer who shall present himself in a shirt which bears evidence of having been worn at work during the preceding week.

. . . no article shall be allowed to remain in the dressing-rooms after it is unfit for use.

It was certainly the day prior to the suntan cult since—

Shirts worn by printers while at work in the Bureau must not be cut so short in

the sleeves nor be open so far in front as to violate decency. To accomplish this the sleeves of shirts must come to the elbow and shirts must be buttoned to the throat.

A college education was not necessary to succeed in life and an employee started at the bottom of the ladder and worked himself up inasmuch as—

Youths employed as messengers . . . must possess a good common-school education. They will be considered in the line of promotion to such division clerkships, when vacancies occur, as they may be found, on examination and trial, qualified to fill.



A 1914 group clustered around a phonograph during luncheon period. The sign reads: "This machine was presented to the Director by Thomas A. Edison for the use of the employees of the Bureau of Engraving and Printing."

The Civil Service and Servants

The stress of the Civil War saw the beginning of a movement to increase the efficiency of the Federal service by changing the method of appointment to the secondary positions in the various Government departments. Though the idea was doomed to failure, it was at least a beginning. Government agencies had long been plagued by the patronage system. An effect of the spoils system is expressed in the U.S. Civil Service Commission's *History of the Federal Civil Service—1789 to the Present* [1941]:

Probably the Civil War would have ended in much less time if all [Presidential] appointments had been made on the

basis of ability. On the other hand, disgruntled factions might have seriously crippled the program by a refusal to co-operate.

The Treasury's moneymaking operations were not exempt from the pressure to appoint party worthies and "deserving" constituents. While the basic production functions were performed by skilled tradesmen, they were relatively few in number. But the related processing operations were such as to require the services of many hands. Much of the work was of a sedentary nature and of a type that called for manual dexterity rather than a great deal of formal education. Many of the operations were particularly suitable to be handled by

female employees. The hiring of women for Government work was a relatively new practice brought about by the exigencies of the war. Since the Bureau was one of the few establishments where there were a great number of positions for females, the Secretary and the head of the agency were constantly being importuned to hire the friends of politically influential persons.

Spencer Clark was not gentle in his evaluation of the situation. In 1868, Congressman Thomas Allen Jenckes of Rhode Island introduced his fourth bill to reform the Federal civil service. He accompanied it with an analysis of comments garnered from the answers to questionnaires he had sent out to numerous Government administrators. Clark was one of those contacted. Asked to com-

ment on the present "condition of the civil service," he replied, "I do not well see how it could be much worse." His solution for making it "more effectual" was "... divorce its working details from the individual actions of members of Congress." He then went on to recite an instance illustrating the practical workings of the system: "One of the Auditors [of the Treasury], noticing that a (then) recent appointee performed no labor at his desk, remonstrated, and told him he must do more work—'*Work!*'—replied the neophyte in amazement—'*I worked to get here!*'"

In answer to the specific questions as to whether any person had been appointed to the subordinate offices under Clark without examination and upon what recommendation or supposed qualifications

Some five years later, Bureau employees were making their own music. The high-derby hat personage is Director James L. Wilmeth. The gentleman in the fedora is Assistant Director James M. Fisher. The band leader is "Bill" Doaks.



such appointment was made, the Chief replied:

The "supposed qualifications" so far as I am aware are that the parties recommended *live in the member's district* who urges their claims. This has generally been the prominent "qualification." Sometimes the additional "qualification" is stated that they have been in the Army, or have lost relations by the war. Partisans appear careless as to any other qualification in making their recommendation. . . . Women are frequently strongly commended to me because they are weak, or sickly, and unable to work, There would be powerful incentives to comply with the request if I was in charge of a Charity Hospital, but inasmuch as hard and unremitting labor is required of all the operatives in this Division, such reasons fail to impress me that there is any official propriety in hiring women thus commended. Others have been pressed upon me where better qualifications were urged; but the qualification, on trial, failed to appear.

Clark was impartial in his criticism. He stated that he had served in the Department under seven Secretaries of the Treasury and had the opportunity to see the effect of the patronage system under different political parties. In this regard, he wrote:

I find no material difference in respect to parties. Whichever party is in power, the general result is the same. The abuses continue, and are not infrequently aggravated at each political change, irrespective of the party made ascendant by the change.

Clark was merely reiterating, in detail, what the 1866 congressional Joint-Select Committee had to say on the subject from its investigation of the methods adopted by the Treasury Department in the printing of securities and the guards established

to prevent frauds and mistakes in the operations.

. . . the committee do not mean to intimate that all or even the majority of the persons employed by the government in these affairs are either incapable or unfaithful; but, from political or other causes, so large an element of incapacity, carelessness, and unfaithfulness is introduced into the operations, as, in a considerable degree, to derange and paralyze the efforts of those who are sincerely desirous of doing the best possible for the government.

With the change of administration that occurred in 1877, one of the first acts of the new Secretary of the Treasury, John Sherman, was the setting up of a committee of Department officials to look into the operations of the Bureau. That group asserted:

We cannot condemn too strongly the system of patronage, which is chiefly responsible for the extravagance and irregularities that have heretofore marked the management of the Bureau, and which, it is safe to say, has cost the people millions of dollars in this branch of the service alone. Without it, there would have been no incentive to waste the public moneys in the payment of needless employes; with it, no matter what reforms may be instituted for the time, we greatly fear that no permanent improvement is possible.

The committee's report is replete in details of its findings of the adverse effect the patronage system had on the cost of Bureau operations. In language, often acid in tone, it castigated the abuse; for example,

. . . the Bureau has been made to subsist, to a great extent, the purpose of an almshouse or asylum. If a woman was found to be in destitution, that fact was deemed a sufficient cause for demanding that employment be given her as an act

of charity regardless of the needs of the service or her own competency; and in this way many people who, in any other city, would have depended on some public or private charity, have found a refuge in a Bureau which aims to compete with private enterprise, and which, in order to fulfil the purpose of its establishment, should be essentially a workshop.

The Pendleton Act, passed in 1883, which established the competitive civil service system, directed that the four classes of clerks created in the departments at Washington by the salary act of 1853 be made subject to appointment on the basis of competitive examinations to be conducted by the new Civil Service Commission. These positions were incorporated into what became known as the classified civil service; those not subject to competitive examination, but included in the civil service system, were referred to as the unclassified service. The same act of origin also gave the President authority to direct the heads of the departments to add other positions as well as classes of positions to those cited.

Because the greater portion by far of the work performed in the Bureau was other than clerical in nature, few of its positions were covered by the provisions of the Civil Service Act. However, on June 29, 1888, by order of President Grover Cleveland, coverage was extended to all positions in the Bureau with exception of those of watchmen, charwomen, and the lowest grade of male laborers. The position of watchmen was placed under civil service in 1896; and those of charwomen and laborers in 1905 and 1906, respectively.

It must have been with a great deal of restraint that the Chief of the Bureau con-

finied his comments concerning this welcomed development in his annual report for 1888 to—

The first and most striking effect of the order was to put a stop to the importunity for employment, which had become an intolerable annoyance and a serious hindrance to the proper performance of the public business.

One can almost hear the Chief's sigh of relief as he dictated a letter of February 19, 1889, in answer to a request for information regarding appointment to the Bureau: "I have to say that all places held by women, except the charwomen, are within the civil service classification, and that application for proper instructions as to the way to proceed in order to secure an examination should be made to the Civil Service Commission, Washington, D.C."

But the employment picture in the Bureau was not all dismal. Many employees spent the greater part of their years in the service of the agency—and gave not only the best years of their lives but also their best efforts to the Bureau. It is not unusual to find that many employees' service spanned periods of 40 and 50 years. One such instance is that of Emma S. Brown who came to work in 1865 when she was not quite 11 years old and spent more than 58 years in the Bureau's employ. Her family had come to Washington from Philadelphia when her father had received an assignment to work at the Treasury Department in connection with the construction of its security vaults. While engaged in the task he became a victim of pneumonia and died. The burden of the family's support fell to the only son, Alonzo Y. Brown, a soldier



Edward M. Hall with only 25 years' experience as an engraver.

with the 188th Pennsylvania Volunteers, who was killed in action during the siege of Petersburg in July 1864. The mother was a cripple and unable to work and, consequently, Emma Brown was given employment in the Bureau. She retired on April 24, 1924, from the position of forewoman of the trimming section in the Bureau's examining division.

Miss Brown's longevity record was unusual, but there was another employee, Edward M. Hall, whose 61-year period of service was indeed unique. He started his career as a helper on January 2, 1879, when the Bureau was housed in the main Treasury building. He died at the age of 77 while still in the employ of the Bureau, on December 23, 1939. At the time of his death Hall was a letter engraver, the craft to which he was ap-

pointed as an apprentice 6 months after he entered the Government. He had the unusual honor of receiving a 2-year Presidential exemption, which was later extended for life, from compulsory Federal retirement at age 70. Hall also had the distinction of having applied his labors in every home of the Bureau, from the main Treasury to the Bureau annex building completed in 1938.

In December 1928, Hall was honored at the first awards ceremony for employees who had attained a half century of Bureau service. The ceremony took place in the Secretary of the Treasury's office. The awards were bestowed by Secretary Mellon amid the flashing lights of cameras and the drone of motion picture equipment. Similarly honored at the same time were Miss Maggie Cross, a blank-paper counter, with 55 years of service; Miss Lucy Woodin, national bank currency stock clerk, and Miss Bridget C. O'Neill, final sheet examiner, each with 52 years; Miss Annie Geddes, assorter-examiner, with 51 years; and Miss Alice Lehman, offset examiner, and Miss Mary King, note examiner, with 50 years of service.

Bureau longevity has not been confined to the "good old days." As recently as 1958 when the Treasury Department inaugurated its length-of-service awards program, there were then 57 Bureau employees on the rolls who had 40 or more years of Government service. At the time of the initial presentation ceremony held in connection with this program, Mrs. Teresa M. Gerhardt, forewoman of the Bindery Section, was recognized for her 50-year tenure, and Andrew S. Wright, plate printing foreman, for his 48 years,

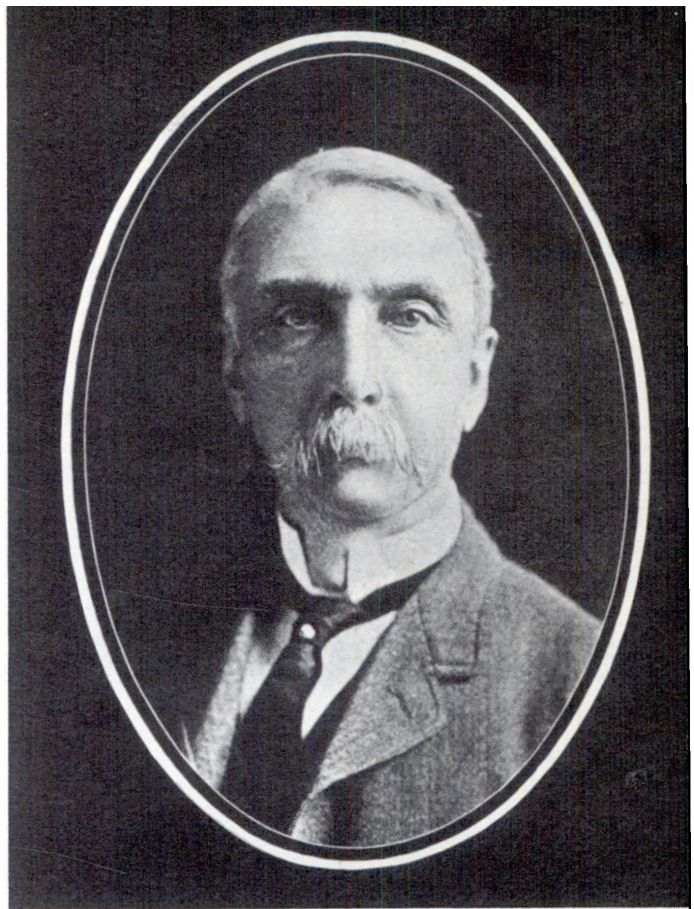
both of whose entire working careers were spent in the Bureau.

The Bureau's files contain numerous accounts of individual employee accomplishment in building and maintaining the agency as a strong, efficient, and proud segment of the Federal service. Perhaps, of all those who thus labored through the years none better exemplifies the Bureau esprit de corps than Thomas J. Sullivan who was appointed Director on July 1, 1906. Sullivan began his career in the Bureau on December 1, 1869, as a book-keeper with the admonition, he later recounted, ". . . that if I proved competent—I should be permanently employed, if not—I was not to be disappointed if not retained." Proof of his competence is evidenced in the fact that he was given three promotions during his first year of employment. In April 1873 he was made chief accountant and in 1882 was appointed the assistant head of the Bureau. He held that position for more than 24 years until he was appointed Director.

The main Bureau building can well be regarded as Sullivan's memorial, for he worked efficiently and steadfastly to acquire an appropriate and adequate physical plant for the agency. He did not live to see it erected, for he died on May 4, 1908. One of the eulogies paid him was:

The one dream of his life was to have a new building, ample for the needs of the Government, and a little over a week ago [April 1908], when he walked into the big printing room, and announced that Congress had appropriated for a new building, for which he had labored day and night so long, that day was probably the proudest of his life.

Today, there hangs in the vestibule of the main building a large bronze plaque dis-



THOMAS J. SULLIVAN

Assistant Director, March 1882–June 1906
Director, July 1906–May 1908

(Actually, Sullivan was appointed to the position of Assistant Chief of the Bureau. When the title of the Chief was changed to that of Director, effective July 1, 1896, Sullivan's title was likewise changed.)

playing a likeness of Sullivan, erected as "a tribute from the employees of the Bureau of Engraving and Printing"—a mute testimony of the esteem with which he was regarded by his fellow workers.

Division of Work

With the transfer in 1880 of the printing of documentary and proprietary stamps from private concerns, responsibility for the production of all major U.S. securities, except postage stamps, was vested in the Bureau. And the transfer

of that one remaining class of work appeared to be close at hand. Just 1 year previously an appropriation act for the Post Office Department had been enacted which contained a proviso that if postage stamps could be printed by the Bureau at less than they then cost, ". . . the work of printing the same shall be given to said Bureau . . ." (20 Stat. 357). Actually, such transfer did not occur until 1894.

The Bureau in its 18 years of existence had proven its worth. It had weathered the storms of protest and opposition to engaging even in the partial printing of currency and then to the eventual taking over of this task in its entirety. Its champions had succeeded in defeating the legislative proposal made in 1877 to have all Government securities printed under contract and to reorganize the Bureau in such a manner as would have reduced it to a mere nonentity.

The committee set up by Secretary of the Treasury Sherman in 1877 to review the operations of the Bureau noted that congressional committees previously investigating the propriety of dividing the printing of Government securities had reached the general conclusion that some portion of the work should be done by outside parties in order to obtain greater security against fraudulent issues. Sherman's committee "fully and cordially" concurred in this conclusion. Many drastic changes in the management of the Bureau were effected as the result of that group's findings. The extent of the modifications made on the committee's recommendation can be gaged by the fact that within 6 weeks after the members began their investigation, 538 employees

were dropped from the Bureau's rolls.

Apparently, the committee failed to convince the Secretary of the advisability of dividing the responsibility for printing currency since his 1877 annual report stated:

After careful examination the Secretary is satisfied that the work, as done in the bureau, is more perfectly done than that heretofore done in private establishments, even at the high rates paid. Upon the question of safety, the Secretary cannot see how it is possible for the Government to be better protected from fraud or mistake than it now is. But the question of safety being one of public policy, the consideration of which properly belongs to Congress, the Secretary respectfully submits it to that body, with the remark that, as the Government has been able with absolute safety by its own agents, to make and issue its gold and silver coin, analogy would indicate a similar course as to its paper circulation, and experience shows its practicability.

Congress took no action in this matter of "public policy." Actually, the situation remained at a status quo until 1885. On July 16 of that year the work of sealing and separating U.S. notes and gold and silver certificates was transferred from the Bureau to the Office of the Treasurer.

The previous May 1, a new Treasurer of the United States had assumed office. In his opinion the method then in effect of issuing currency "appeared . . . to lack the security which is had in every institution where such instruments of credit are issued." On May 4, the Secretary directed that the imprinting of the seal on U.S. notes and certificates by the Bureau be discontinued. Later that month he appointed a committee to devise and recommend to him a plan for sealing and

separating the notes under the supervision of the Treasurer of the United States. The committee reported that absolute security against fraud and overissue "can best be attained by intrusting the final authentication of the public securities to other control than that of the mechanical establishment by which they are executed." Apparently, the Bureau's record of past performance was taken for naught. Then too, the person who would normally be expected to come immediately to the Bureau's defense, the Chief of the agency, Edward O. Graves, was the very man who had headed the group of Treasury officials that investigated the Bureau in 1877. It was his committee that advocated the division of work at that time. Graves was appointed Chief on June 1, 1885, 2 days after the review committee was established. He was probably of the opinion that the then-contemplated action was the best approach for solving what he considered a serious situation.

The 1885 committee's report having been approved by the Secretary, steps were taken at once for the transfer to the Office of the Treasurer of the presses, machinery, and operatives required to carry its recommendation into effect.³

The matter of having all the work centralized in the Bureau was revived in 1908. The subcommittee of the House

Committee on Appropriations in reviewing the matter at that time was not impressed with the arguments advanced for the continued separations of the functions. It was pointed out that the supposed security provided by shipping national bank notes out of the Bureau unsigned was actually ineffective. The courts had held the banks liable for bills that were issued into circulation by them without the usual officers' signatures. It was argued, since the Bureau had sustained no loss of national bank currency, could it not also handle U.S. currency as well. The matter was again taken up by the subcommittee during the hearings for the next year's appropriation.

Finally, in 1910 the operations were retransferred to the Bureau when it was shown that it was possible to combine the printing of the seal with the numbering of the notes, thereby effecting an annual savings in excess of \$150,000. From that time on, the Bureau has continued to perform all functions relating to the printing and processing of U.S. currency.

³ National bank currency continued to be sealed at the Bureau. Since these sheets were delivered to the individual national banks in uncut sheet form, where the notes were signed by the appropriate officers and then separated, it was evidently thought that the procedure was sufficient protection and no further division of the work was necessary.

CHAPTER IV Production

Expanded—new horizons in a new century 1894—1913

THOUGH THE U.S. postal system dates back to 1782, its first postage stamps were not introduced until 1847. True, some postmasters had special stamps or devices made up for use as evidence of prepayment of postage fees, but these were strictly provisional in nature. The first national issue of stamps consisted of but two denominations: a 5-cent stamp bearing the likeness of Benjamin Franklin and a 10-cent stamp showing a portrait of George Washington—a far cry from the many denominations and classes of postage stamps now in use.

The Bureau took over the production of postage stamps on July 1, 1894. Prior to that time, the stamps had been customarily printed for the Post Office Department by private banknote companies. There had been two exceptions to this procedure insofar as the Bureau was concerned. The particular reasons why the services of the Bureau were employed in these two instances remain unexplained.

In January 1875 the following letter,

relative to a matter that was to prove of great philatelic interest in years to come, was received in the Bureau from the Post Office Department.

JANUARY 23, 1875

GEO. B. McCARTEE Esq.

Chief Bu. Engraving & Printing Treasury Dept.

SIR: The Department is making preparations to sell to stamp collectors and others specimens of all the postage stamps ever issued under its auspices.

The plates are still extant for all the several issues except that of 1847, (the first issue,) embracing the denominations of 5 and 10 cents. To obtain these it will be necessary to re-engrave the plates: and by direction of the Postmaster General, I have the honor to request that you take the matter in hand, if consistent with your official duty.

Also, please cause to be prepared from the new plates, 10,000 stamps of each of the two denominations, as nearly similar as possible to the originals herewith.

Very respectfully, &c.

WM. M. IRELAND

Acting 3d Asst. P.M. General

Charles Burt and George McCoy were assigned the task of engraving the reproductions. The work was printed in 50-subject sheets and was left ungummed. There were 11,450 specimens of the 5-cent value and 10,000 of the 10-cent denomination delivered to the Post Office Department.

Strictly speaking, these items produced by the Bureau cannot be regarded as reprints of the original issue. The earlier stamps had been demonetized in 1861, soon after the outbreak of the Civil War.¹ Then too, the Bureau prints were specifically declared invalid as postage stamps.

It is interesting to note that in 1947 the Bureau was again called upon to reproduce the original designs in connection with the production of a souvenir sheet commemorating the centenary of U.S. postage stamps. The variances in finished details between the original stamp designs and the reproductions of 1875 and 1947 are easily discernible to

¹ This was done to preclude the large stocks remaining on hand throughout the States in rebellion from being used to the advantage of the Confederacy.

the skilled eye. The failure to secure absolute duplicates of the originals in no way reflects on the abilities of the master engravers who did the copying. Rather, it is an exemplification of the fact that the nature of engraved work is such that perfect imitation is virtually impossible.

On May 20, 1875, the Post Office Department requested that the Bureau prepare a die for a new 5-cent ordinary postage stamp. The item was required by the revised foreign letter rate agreed upon by the member-countries of the General Postal Union in convention at Berne, Switzerland, in 1874. The new rate was to become effective July 1, 1875. Actually, the treaty agreement was not ratified until May 3, 1875. This short interval between the time of ratification and the effective date may account for the Bureau's being asked to assist in this instance.

The May 20 request was evidently a formal followup of previous verbal discussion, for the writer specified that the stamp was to be "of the design (head of [Zachary] Taylor) approved some days since," A transfer to a roll was made from a Taylor portrait die already on hand which originally had been employed in preparing plates for printing bond coupons. This roll was used in preparing the die for the new 5-cent stamp which was engraved with a border of compatible style with that of the ordinary series of postage stamps then current. One week later the die was turned over to the Post Office Department.

The feasibility and propriety of assigning the printing of postage stamps to the Bureau had long been debated. As previously noted, legislative authority for

having the work done at the Bureau on a qualified basis was contained in the appropriation act for the Post Office Department in 1879. While the appropriation act for the next year was silent on the point, that passed in 1881 (21 Stat. 376) specifically provided for the repeal of the 1879 proviso in full. Notwithstanding this fact, there was deemed to be no legal impediment to the manufacture of postage stamps by the Bureau. This is borne out by the specifications issued by the Post Office Department in 1885, 1889, and 1893 for printing the stamps on a 4-year contract basis. Each expressly stipulated that, should the Secretary of the Treasury submit bids or estimates found to be more advantageous to the Government than those submitted by private contractors, the Postmaster General reserved the right to award the contracts to the Bureau.

There were three private bidders for supplying the stamps under the 1893 advertisement. A proposal to do the work was also submitted by the Chief of the Bureau, with approval of the Secretary of the Treasury, at a cost amounting to almost \$7,000 less than the lowest bid received. The Bureau letter stated:

The Government has in this Bureau [Engraving and Printing] the most extensive and complete establishment engaged in the work of engraving and plate printing in existence. It is installed in a substantially constructed and thoroughly fire-proof building; it has a plant of the most improved machinery and appliances for the execution of such work, and a large force of thoroughly trained employees. It executes all of the work of engraving and printing the securities of the Government and the volume of work finished by it yearly is the largest of any

such establishment in the world. Its business is so systematized as to give the greatest security possible in handling of values against unauthorized issues or loss from any source.

* * *

The Post Office Department would therefore, by the execution of its postage stamps in this Bureau, receive the advantage of this system already in operation for the protection of the Government issues. With these facilities and advantages possessed by this Bureau it is only reasonable to expect that it can do all of the work of this character required by the Government more cheaply than any private individual or firm could undertake it for profit to itself. In the execution of the work on the securities of the Government it is necessary to employ portrait, vignette, and other engravers, superintendents, clerks, and a large number of skilled artisans of various kinds whose number and compensation remain the same until the maximum amount of work which they are capable of performing is reached. The cost of this force is in the nature of a permanent or fixed charge against the amount of work to be executed and no additional expense on this account is incurred until the amount of work to be done exceeds their capacity. For the execution of the adhesive postage stamps by this Bureau the cost would therefore be only the actual additional expenditure incurred by it on account of the execution of this work.

When the Bureau's proposal was made public, there was a loud and strong protest voiced by the private contractors. Aside from advancing the point that the Bureau had no legal authority to perform the service, they also contended that the agency had not submitted its offer in accordance with the terms outlined in the Post Office Department's advertisement for bids. The matter was therefore submitted to the Department of Justice



Gumming postage stamps—1903.

for review. Upon the rendition of an opinion that there was no legal impediment involved, the contract was awarded to the Bureau by Post Office Department Order No. 59 of February 21, 1894.

In April, the Department turned over to the Bureau a quantity of dies, rolls, and plates of the then-current stamps. No further use was made of the rolls and plates, but the dies, after being slightly altered in order to distinguish the Bureau's printings, were employed in the manufacture of new plates.

Finally, a formal 4-year agreement was entered into, under date of June 9, 1894, between the Postmaster General and the Secretary of the Treasury, "in order to

prevent any mistake or misunderstanding in the future in connection with the manufacture and issue of postage and special-delivery stamps for this Department by the Bureau of Engraving and Printing, on and after the 1st of July, 1894"

In getting the operations underway, the Bureau was not without its trials and tribulations. The situation is described in a report of the Third Assistant Postmaster General dated October 31, 1894.

In entering upon the work under this new arrangement, a great many difficulties were necessarily encountered. A large number of printing machines had to be fitted up by the Bureau, perforating

and gumming machines had to be secured, a considerable force of employees had to be trained to do the work promptly, large numbers of new plates for printing were needed, arrangements for storing and shipping the enormous number of stamps constantly required had to be made, to say nothing of many details entering into the intercourse between the two Departments in the transaction of their respective shares of this business. But I am happy to say that everything has been satisfactorily arranged, and the work is now proceeding without serious interruptions.

Perhaps one of the most vexing problems encountered involved the gumming of the stamps. When awarded the stamp contract, the Bureau had no gumming machines. Heretofore such stampwork as had been produced in the Bureau had been gummed by hand. Such a procedure would have been totally inadequate to handle the great volume of postage stamps needed. Since gumming equipment was not manufactured on a commercial basis, it was impossible to purchase the needed machinery. The private banknote firm which previously produced the stamps would not make its equipment available or divulge its mode of operations. It was thus incumbent upon the Bureau to develop its own machines. Working only upon the recollections of an employee who had previously been in the service of the private contractor and who had operated their equipment, the Bureau accomplished the feat. The first machine was a crude affair, but through adaptation of constant improvements the Bureau's equipment was perfected to such a point as to merit the comment of a leading printing-trade journal in 1905 that the "provision of a

uniform coating of adhesive [for postage stamps] is one of the remarkable features of the work of the institution." It describes the operation as follows:

The Government expends nearly \$50 a day merely for the gum which is prepared in monster 100-gallon kettles in the basement of the big printery. In order to meet the varying climatic conditions of the different seasons of the year the character of the sticky substance is changed four times each twelve months. The hardest gum is used in summer and the softest in winter. The sheets of newly printed stamps—400 stamps in each sheet—are given a coating of gum by passing under a roller from which oozes just the right proportion of mucilage, and then they are carried by means of an endless chain through a wooden tunnel fifty feet long, where a high temperature is maintained and from which they emerge perfectly dry.

The first of the work printed by the Bureau was placed on sale on July 18, 1894. This 6-cent reddish-brown ordinary stamp was soon followed by the 4-cent denomination which was issued on September 11. By the end of the first year of operation, the Bureau had printed and delivered more than 21 million sheets of stamps for the Post Office Department embracing 13 denominations of ordinary postage stamps as well as miscellaneous values of special delivery, postage due, and newspaper and periodical stamps.

That the Bureau was successful in the undertaking is evident from a letter of July 9, 1917, from the Postmaster General to the Secretary of the Treasury. It had been rumored that the Treasury Department was considering abandoning the printing of postage stamps because of the Bureau's tremendous workload.

The Postmaster General was writing "to express the hope that such a change will not be made." In support of this stand, he wrote:

As a matter of correct public policy, all fiscal issues of the Government should be produced in a Government plant. The service given by the Bureau of Engraving and Printing has been satisfactory in every respect, and greatly improved over that which obtained under previous private contracts. All the precautions and safeguards thrown about the production of currency and bonds are extended to the postage stamps. All requisitions of this Department are filled promptly and accurately, the Bureau's record for accuracy being substantially perfect, so that this Department can absolutely rely upon it, which is a matter of much importance in issuing stamps to the 56,000 postoffices of the country. . . . The materials used and the workmanship are excellent, and our postage stamps possess a high order of artistic merit. . . . The Bureau is progressive, and in recent years has successfully brought out such important improvements as the stamp book and the coiled stamps, which not only are of much advantage to the public and the postal service, but produce a yearly profit to this Department of more than \$200,000. Its officials have always worked in a spirit of complete harmony with the Post Office Department, complying with every request cheerfully, promptly and most efficiently.

At the expiration of the original contract, the agreement was renewed for another 4 years. It is definitely known that this contractual scheme remained in effect into 1919. Apparently, it fell into disuse thereafter because of the incongruity created. There was a statute on the books (34 Stat. 475), initiated in 1906, providing that "no contract for the manufacture

of adhesive postage stamps, special delivery stamps, or books of stamps shall be made by the Government [Post Office Department] with any Department or Bureau of the Government below the cost of such work to the Government." Even though a stipulated charge for postage stamps had been agreed upon under formal contract, whenever there was a rise in cost of the basic materials used by the Bureau in manufacturing the stamps, that production charge had to be adjusted accordingly. Likewise, it was the practice to immediately lower the charge when economies were realized through the introduction of improved methods and equipment in the manufacturing processes, rather than to hold to the originally stipulated fee.

Under the arrangement currently in effect, the Post Office Department furnishes the Bureau an estimate of its postage stamp needs just prior to each fiscal year. This estimate is used by the Bureau in planning its production program and the stamps printed are billed for at cost.

Philippine Currency and Postage Stamps

Under the terms of the Spanish-American War peace treaty of December 10, 1898, Guam, the Philippine Islands, and Porto Rico were ceded to the United States. By the same treaty Cuba was relinquished to the United States in trust for the Cuban people. These territories were first administered by military governments under the jurisdiction of the U.S. War Department, other than Guam, which was placed

under the charge of the Navy Department.

The Bureau was called upon to supply the postage stamps used in these territories. Originally, all four areas were furnished regular U.S. postage stamps overprinted with the name of the respective territory in which the stamps were to be used. However, it was only in the case of the Philippines that a special currency was prepared. Thus was begun a pleasant relationship between the Bureau and the Filipino people that was to endure through the years.

A congressional act of March 2, 1903 (32 Stat. 952), which established a standard of value and provided for a coinage system in the Philippine Islands, authorized the Secretary of the Treasury to have currency notes printed upon request of the Philippine Government. Accordingly, the Bureau was immediately called upon to produce an issue of Philippine silver certificates of three denominations: 2, 5, and 10 pesos. With but one exception,² Philippine currency is the only regular currency other than that for the United States which the Bureau has produced during its 100 years.

The original design proposed for the Philippine notes, which was at first deemed satisfactory, was later rejected on the basis that "the Secretary of War [Elihu Root] was fearful that there might be confusion between U.S. notes . . ." and the suggested design. In submitting a second design for consideration, the Director of the Bureau on May 6, 1903, wrote to the War Department's Bureau of

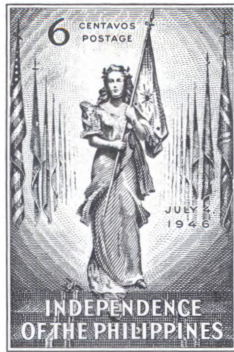
Insular Affairs, the agency assigned to serve as liaison for Philippine Government matters, as follows:

I submit herewith [a] new model of a silver certificate for the Philippine Islands of the denomination of two pesos. This model has been prepared after careful consideration of the suggestions made by the Honorable Secretary of War and yourself, the most important of which were that there should be a marked difference between the Philippine and the United States certificate, so that one could not be passed for the other, and there should also be a marked difference between the denominations of the Philippine certificates, so that the lower denominations could not be passed for the higher denominations. To meet these suggestions the size of the certificate has been materially reduced to a small oblong 6½ in. x 2⅝ in., and an additional printing has been added to the face, which in the case of the two pesos certificate is blue.

The design was accepted and used, but little was it dreamed that the decision was to have a bearing on the future reduction in the size of U.S. currency some 20 years later. The successful use of the small-sized Philippine currency was a significant factor in the adoption of a similar size for U.S. paper money in 1928.

The Bureau continued to produce Philippine currency of various classes, series, and denominations until the Islands assumed national status. Thereafter only reissues of notes originally prepared before that time were produced for the Philippine Government. This was in accord with Treasury Department policy that the Bureau's facilities should not be employed in competition with private industry. In all, the Bureau delivered 397 million Philippine currency notes between 1904 and

² An issue of currency was produced for the Republic of Cuba in 1934. (See ch. VI.)



6-centavo postage stamp of Independence of the Philippines issue.

1949, when the last delivery of this class of work was made.

The U.S. postage stamps overprinted "Philippines" were replaced in 1906 by a special issue peculiar to the Islands. As in the case of Philippine currency, the Bureau continued to produce Philippine postage stamps until the Islands took on the status of an independent republic on July 4, 1946. The last stamps so produced were the three denominations of identical design commemorating Philippine independence. This was an issue of particular beauty. In order to do justice to the design, the stamps were printed in an outsize of 1.15 by 1.72 inches. The central vignette was designed by the renowned Philippine sculptor, Guillermo E. Tolentino. It depicts a Filipina wearing the delicately flowing terno, the native dress of the country. She is shown holding the national flag of the Philippines and preparing to enter it among those of the other nations of the world. The frame and lettering of the issue were designed by a Bureau artist.

The practice of furnishing regular U.S. postage stamps overprinted "Cuba" was

short lived. In 1899 the Bureau, at the request of the U.S. Post Office Department, designed and printed a distinctive issue of stamps comprising 1-, 2-, 3-, 5-, and 10-centavo ordinary values and a 10-centavo special delivery stamp especially for use there. Even though the U.S. military administration of the island ceased in May 1902, the Bureau continued to furnish these stamps for the Republic of Cuba until fiscal year 1905.

Overprinted "Guam" and "Porto Rico" postage stamps were not required after 1900, with the establishment on those islands of regular mail service under the jurisdiction of the U.S. Post Office Department. Since that time regular U.S. postage stamps have been used on the two islands.

Coiled Postage Stamps

Today, when it seems that coin-operated vending machines have but recently become standard equipment for offices, factories, and places of public amusement, it may come as a bit of a surprise to learn that a variety of such machines were being marketed in the early 1880's. The turn of the 20th century saw a tremendous increase in the uses to which this type equipment was being put. Dispensing machine manufacturers were quick to consider the sale of stamps as a new use for their products. They were soon followed by several office equipment firms which introduced lines of stamp-affixing machines.

At the time, printing of postage stamps was confined to individual sheet form. In order to obtain stocks for stamp dispensers, it was necessary for either the machine manufacturer or the private user to at-

tach a given number of sheets of stamps one to another, cut the rows of stamps into strips, and then wind the strips into coils. This was a tedious task. Then too, the sheets had been perforated for separating the stamps by hand and work so perforated often proved too fragile for dispensers. The solution lay in making unperforated sheets available to be produced into coils privately. Imperforate sheets for this purpose were distributed on an experimental basis in 1906, and by 1908 were available at post offices as a regularly stocked item.

Meanwhile the Bureau had been experimenting in processing stamps into coil form. The first of this experimental work was issued on February 18, 1908. These coils were produced from regular sheets of 400 stamps perforated horizontally and cut into strips of 20. The strips were then pasted together to form coils of 500 or 1,000 stamps each. Soon thereafter the Bureau developed a machine for preparing the coils which materially reduced processing costs. The report of the Third Assistant Postmaster General for the fiscal year 1909 gives the following description of this piece of equipment and detailed comments concerning its advantages:

[It] is of simple and effective construction and performs the work of about ten operatives. Under the old method of coiling the cost is from 6¢ to 12¢ per coil. During the past year the demand for coiled stamps grew to such an extent as to make this expense something of a burden and it became necessary to charge it to the users. With the new machine, however, the coiling is done at a cost of a fraction of a cent and the extra charge can probably be discontinued. If a sufficient number of the machines can be installed during the coming year it should



Stamp coiling machine in use until 1958.

be possible to supply coiled stamps for general purposes.

An improved model was developed in 1910 which cut the pasted stream of horizontally perforated sheets of 200 stamps into strips, trimmed the margins, and wound the strips into coils in one operation. Through use of this machine the Bureau was able to produce the stamp coils at a much lower cost. The reduced production rates, in turn, were reflected in the service charges made by the Post Office Department for coiled stamps. The charge for coils of 500 perforated stamps was reduced from 8 to 3 cents; for the same quantity, unperforated, from 6 to 3 cents; items of 1,000 stamps, perforated, from 12 to 6 cents; and 1,000 stamps, in unperforated form, from 9 to 6 cents. Even with this improved equipment the necessity of pasting the individual sheets together was still a drawback in the preparation of coils. It

seemed that the most feasible means for elimination of the problem was the development of a press for printing the stamps in a continuous roll form. Steps were taken to devise such a machine and success in this regard was achieved by 1912. The impact of this press toward facilitating the production of coiled stamps is described in the report of the Third Assistant Postmaster General for that fiscal year:

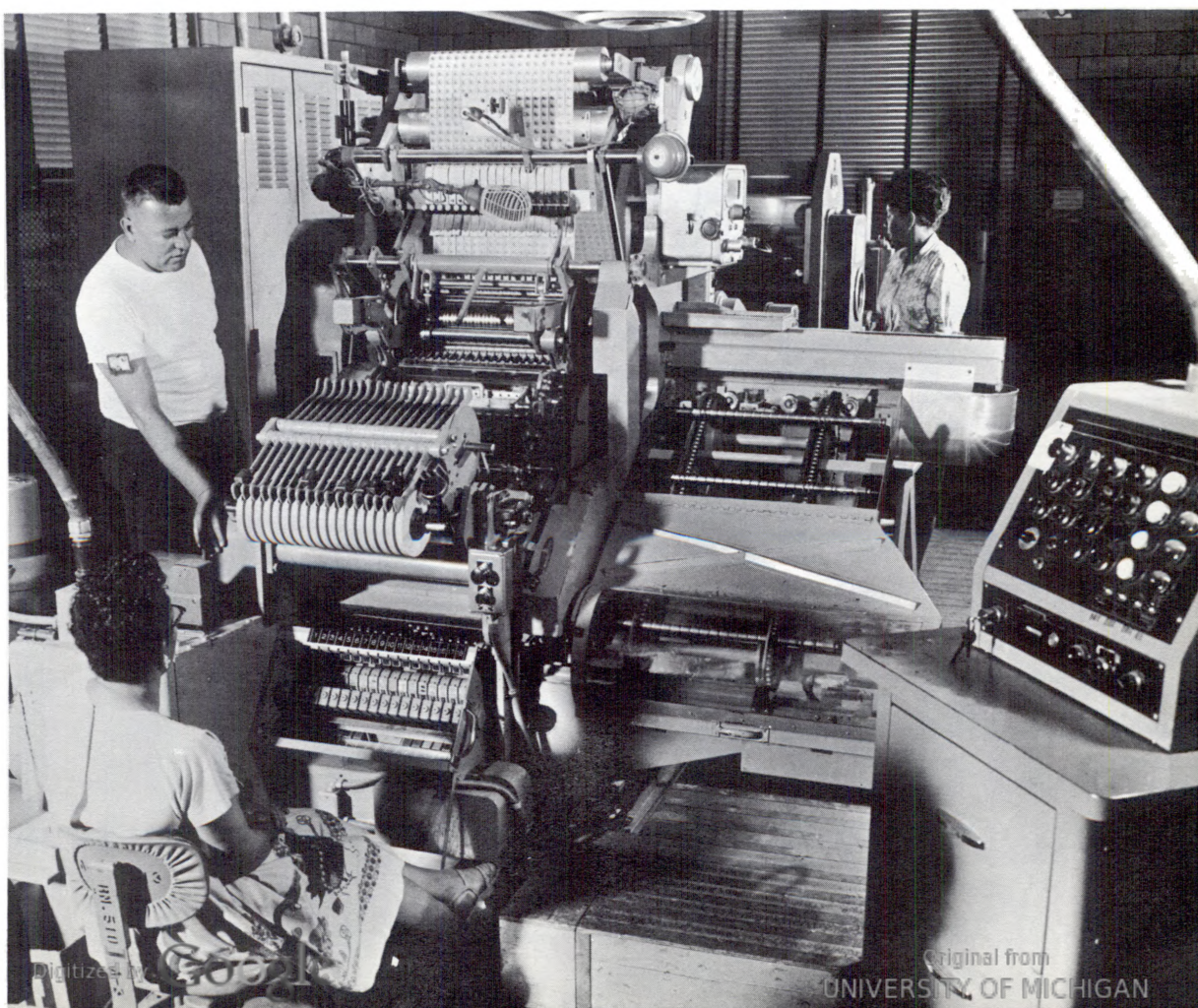
The machine also gums the stamps as they are printed and an exceedingly rapid perforating device has been designed for use in connection with it. . . . Another advantage is that the omission of the preliminary "wetting down" of the paper practically does away with the variation due to shrinkage, making it possible to

perforate the stamps much more accurately so that the "centering" is substantially perfect,³ which is not true of stamps produced by the old method. The greater accuracy of perforation not only improves the appearance of the stamps but will facilitate the operation of automatic vending and affixing devices which feed the stamps by means of pins or fingers engaging the perforations.

With the development of this press, parallel improvements were made in the processing of coils of stamps through the

³ The paper was wet in the machine itself just prior to the printing operation. It was not until after the development of the electric-eye perforator and the dry printing methods that perforation spoilage was reduced to a minimum.

New coiler-perforator introduced in 1958.



Original from
UNIVERSITY OF MICHIGAN

years. In 1929, the Director of the Bureau gave the following description of coil manufacture:

Coils of stamps are made from rolls printed on intaglio web presses, . . . the printing and gumming of the rolls being accomplished at the same time. They are placed in special perforating machines, which perforate the rolls cross-wise only, and wind them again into a roll. These perforated rolls are delivered to operatives at specially devised measuring tables, who unwind the rolls, measure them into lengths of 500, 1000, or 5000 stamps, according to the number of stamps to be in the finished coil, cut each length and insert labels denoting the class and denomination of the coil by pasting one edge to the margin of the cut off length and the opposite edge to the margin of the portion yet to be measured, thus joining the measured lengths with these labels. These lengths are rewound into rolls and the stamps are ready for the next operation—that of coiling.

The spindle on which the stamps were wound during the preceding operation fits into the coiling machine. Eleven knives on the coiling machine slit apart the ten rows of stamps and trim the margin of the outside rows as the roll is unwound, and simultaneously each row is wound into coil form until the labels previously pasted on are reached. The operator at this point stops the machine, separates each coil from the roll by cutting the label, pastes the label as a binder for each coil, and places her initials or name on the binder. The coils are then carried to tables, counted and boxed ready for delivery to the vault from which they are shipped when ordered.

There was little, if any, change made in this manner of manufacturing coils until 1958. However, since it was realized that the manufacturing methods left much to be desired, improvement in this regard was placed high on the agenda of the

overall technological improvement program planned and developed by the Bureau after World War II. In 1955, a contract was made with a private engineering and manufacturing concern for a prototype model of a coil-processing machine. This model was desired for use in conducting experiments geared to the improvement and automation of the coil manufacturing operations. The contract was let on the basis of functional specifications calling for the mechanization of the measuring, examining, slitting, coiling, and wrapping functions. In addition, it was specified that the machine should incorporate facilities for perforating the printed work. The equipment developed by the machine manufacturer consisted of three separate components: an examiner, a perforator-coiler, and a wrapper. These were received in the Bureau early in 1957. After a great deal of joint, concentrated effort and study on the part of the Bureau and the machine manufacturer, the components were perfected to the point that they were placed in regular production on January 27, 1958. Within the year, purchase contracts were made for the additional equipment needed to completely automate coil production operations.

It was indeed fortunate that steps had been taken to develop this type equipment. Without it, the Bureau would have been sorely taxed to meet the unprecedented orders for postage stamps in coil form that were received beginning in mid-1958. A factor in this regard was the Post Office Department's decision to inaugurate an intensive drive to popularize coiled stamps, with particular emphasis placed on a new 100-stamp size. With the

aid of the new equipment the Bureau was able to handle this increase concurrently with the demands for stamps necessitated by the increased postal rates which became effective at that same time.

The coiling equipment processes the printed web down to finished products of precisely 100, 500, or 3,000 stamps, as desired. First, the roll of work is placed in the examining component and an operative examines it for imperfections as it unwinds. This machine has built-in provisions for the removal of imperfect work and the automatic joining of the severed ends. There is also a means by which the operative can flag individual stamps or strips of imperfect work for a later automatic removal. The examined roll is next placed in the second component which perforates the stamps, slits the work by rows, and forms the individual coils. Those coils containing defective work flagged during the examining operations are automatically diverted at this point into a separate bin. The perfect coils are conveyed by a series of belts and chutes to the third component which wraps each coil in transparent plastic film and applies a label indicating the contents and sales price of the item.

Today, the Bureau has 6 of the examining units in regular use, together with 4 perforator-coilers, and 14 coil wrapping machines. About 39 million coil stamps are printed and processed each day.

Savings From Improved Methods

A comparison of deliveries of revenue items for fiscal years 1910 and 1914 would

indicate to the average individual that there had been a decline in the number of revenue stamps being used. By comparison, there were 7 million fewer sheets delivered in 1914 than in 1910. The hidden factor, however, is that there were actually 850 million more stamps delivered in 1914. This situation was brought about by the fact that, although fewer sheets were printed, more stamps were on each sheet. For example, small cigarette stamps formerly printed 80 subjects to the sheet were redesigned and the size of the sheets was enlarged to accommodate 200 subjects. Similarly, sheet cigar stamps were increased from 96 subjects to 200 subjects per sheet, and playing card stamps were doubled in number per sheet from 200 to 400 subjects. There were several other items which were increased in subjects per sheet to reflect additional economies as a result of faster production. These included the various classes of strip cigar, sheet tobacco, stub tobacco, wholesale liquor dealer, distillery warehouse, and sheet beer stamps. Custom wine and malt liquor stamps were also included in the program of redesign. It was estimated that the completed changes would effect a savings of more than \$136,000 annually when applied to the estimated requirements for the fiscal year beginning on July 1, 1915.

There were other changes in the manufacture of revenue items which further enhanced the economy moves. Treasury officials decided that tints used on internal revenue stamps added little to their security features and the tints were therefore eliminated. The use of hand roller presses was further deemphasized and



Currency trimming—1907. The operative on the left is processing \$5 national bank notes; that on the right \$20 gold certificates.

additional four plate power presses were put into service for printing revenue stamps.

Prior to July 1, 1910, it was the practice for the Bureau to trim sheets of U.S. notes and gold and silver certificates on two edges and then number the notes and forward the sheets to the Division of Issue in the Office of the Treasurer of the United States. There, typographic print-

ing presses were used to overprint the Treasury seals on the notes and the sheets were then separated into individual notes on machines requiring two operators each. This work required a force of about 165 people in the Division of Issue. With the approval of the Department, the Bureau undertook to procure machinery that would number and seal the sheets of notes at one operation, with the original

view simply to eliminate one printing. As the experiments progressed it was found that by perfecting the trimming of the sheets, a device could also be attached to the numbering and sealing presses which would separate, collate, and count the notes. A trimming machine to trim all sides of the sheets at once and cut all the sheets to exactly the same size was then designed and constructed in the Bureau. The separating, collating, and counting device was perfected, with the result that the machinery numbered, sealed, separated, and collated the notes, counting them into units of 100 each. It was estimated that the work so performed would be accomplished with a reduced annual expenditure of about \$132,000. The Director's report to the Secretary dated January 19, 1915, included many other items of improvement which reflected an aggregate total savings of over \$1½ million on an annual basis and an accumulated savings of more than \$3 million from March 1909 through February 1914. This special report incorporated 38 items of improvement which in effect reemphasized the Bureau's continuing efforts to comply with the edict of Congress, that work shall be performed as economically and efficiently as possible in the best interests of the Government.

The largest single item of savings reported in this period came about as the result of legislative action in August of 1912. This evolved from the decision that one-fifth of all currency backs could be printed on power presses rather than on hand roller presses during fiscal year 1913, and an additional one-fifth could be accomplished each year by this conversion until all currency backs would

be printed on power presses. The estimated savings on this item alone was reported to be \$90,000 for the first year and an additional similar amount each year until a total of \$450,000 would be realized on a recurring basis.

This relief legislation was particularly welcome in view of the report made by the Treasurer of the United States in February 1912 that the demand for new currency had increased on an average of 16½ million notes each year since 1902; that during fiscal year 1910 redemption of old notes exceeded the issuance of new currency by approximately 4¼ percent; and that he could foresee no lessening of the demand. He attributed this condition to the following reasons:

The growth in the country's population, which has necessarily caused the money, and especially the smaller denominations, to circulate more rapidly, with corresponding wear.

The growth in business activities.

The tendency toward the use of small denominations.

The publicity given to uncleanness and insanitation of soiled notes and the consequent demand for cleaner money.

The necessity for maintaining in good condition an increasing volume of outstanding pieces.

The growing practice of payment of wages in factories, shops, etc., weekly and biweekly, as compared with monthly.

The growing popularity of paper money in sections where silver was formerly in the greatest demand.

As in every printing establishment there are related operations which require constant observation with a view in mind for improvements to effect the best ways to obtain the end product.

The observant eyes of experienced operatives and the mechanical know-how of



Paper-wetting operation—1907.

“watchdog” technicians were responsible for many changes which resulted in a more efficient and economical operation. Early in 1909 it was found that automatic delivery devices could be successfully adapted to the machines used for applying the gum to postage and revenue stamps. The elimination of the hand operation coupled with an improved method of drying, which was developed later that same year, permitted the machines to be operated at greater speeds and consequently more savings were realized by the increased output. Other operations were closely scrutinized during that year for potential savings. It was found that by changing the design of postage stamps, a more durable style of engraving could be utilized and this would add greatly to the life of the plates. A specially designed machine was developed for canceling imperfect sheets of postage stamps. Previously, two typographic

presses were used for this purpose, but only one of the new machines was needed to do the job. Roller attachments installed on perforating machines obviated the use of plater presses for pressing the work and permitted the combination of perforating, pressing, and examining processes. A revolutionary improvement was installed for dampening the paper preparatory to plate printing. From time immemorial it had been the custom in the industry to dampen the sheets of paper by placing them between wet cloths, a method which required subsequent shifting of the sheets to assure that the paper was uniformly dampened. Since this process was both crude and expensive, the Bureau designed and constructed machinery to dampen the sheets singly and uniformly without the use of cloths. The Director, in his annual report for fiscal year 1911, estimated a yearly savings of \$42,000 from the introduction of these machines. A new solution was substituted in washing the wiping cloths used by printers at the press, which prolonged the usefulness of the cloths, saving an estimated \$6,500 annually. It was also discovered that waste inks from the hand roller presses could be used satisfactorily on the power presses with an attendant saving. An indication of the thoroughness with which every phase of the plant's operations was reviewed to realize all possible economies for the Government is evident in the report that a savings was realized by the installation of an ice plant in lieu of contracting for ice.

The examining operations at the various stages of production play a very important part in the Bureau's determina-



"Seven able-bodied sons of Uncle Sam, tried and found true, hereafter will guard the van which daily for many years has carried millions of dollars in bank notes and postage stamps between the bureau of engraving and printing and the Treasury.

". . . The guards are attired in the uniforms of the Metropolitan police, sworn in as special officers, and are armed.

". . . Last year \$12,000,000,000 in stamps and \$3,000,000,000 in certificates were transported from the bureau to the Treasury without the loss of one stamp or certificate."

—THE WASHINGTON POST, June 15, 1910.

tion that only perfectly executed securities, which are exact reproductions of the original dies and plates, should reach the hands of the public. In this manner each and every person can be assured that the Government securities in his possession are undoubtedly the product of legitimate issue. Occasionally, through human error, oddities or trivial defects will appear on securities issued into circulation. In view of the countless numbers of items that have been printed for issue through the years, it is almost unbelievable how few of these imperfections have been overlooked by the eagle eyes of examining personnel. So few, in fact, that they are

invariably retained as curios by the owners. It must be considered that these employees are responsible for searching out everything from the most minute flaw to the most obvious error when examining the sheets of work or individual items. The flaws may be in the form of hairlines caused by scratches in the plate, pinpoint smudges from pitmarks in the plate, fingermarks from handling when the inks are wet, broken lines as a result of improper polishing of the plate, and many other finite markings which can be detected only with keen observance of the experienced eye. The speed and dexterity of these operatives are uncanny.



Currency laundering machine.

Before July 1910 if any deviations from perfection were observed in any subject on the sheet, the entire sheet was earmarked for destruction. In the case of currency notes, which were printed four subjects to the sheet at that time, this would mean that three perfect notes would be destroyed, along with the one note known to be defective. It was found that if the examiner would plainly mark the bad note, the whole sheet could be processed through to a later operation where the sheets were separated into individual notes. The spoiled note could then be removed for mutilation, and the remaining three notes processed to completion. In this manner savings could

be realized from the reduced spoilage.

The Director was gratified that he could report all these economies at that particular time because the Bureau's new building had been recently completed and this was his way of justifying the expenses which Congress had approved in connection with its construction.

Currency Laundering Machines

A Bureau project that seems especially to have intrigued the public's imagination is that of laundering money. Today, some 40 years after the program was aban-

done, inquiries are still received concerning the methods and equipment used to clean soiled currency.

The idea of washing used notes originated early in 1909. At that time it was customary to destroy redeemed currency by maceration. Though the actual destruction operation was the function of another branch of the Treasury Department, the Bureau was charged with the housing and maintenance of the equipment used in this connection.⁴

Prompted by the growing demand for new currency and the resulting necessity for employing a night force to meet this demand, the Bureau undertook an investigation of the feasibility of cleaning soiled currency for possible reissue. Examinations disclosed that at least 30 percent of the notes returned by banks throughout the country were not actually worn but simply soiled. Hence, the Bureau took steps to develop a device for laundering the money. Though of crude construction, the mechanism proved sufficiently practical to warrant further experimentation. As a result, machines were developed for washing, sizing, and ironing the notes in three separate operations. However, inasmuch as the equipment required the services of six operatives, it was regarded with disfavor—the desideratum was a single machine which would perform all three functions in one operation, requiring the services of but two operatives.

Efforts to secure the assistance of manufacturers of commercial laundering equipment in perfecting such a machine

⁴ This practice was probably a holdover from the days when it was customary for the Bureau to use the residual pulp of macerated money in the manufacture of new banknote paper.

were abandoned because the cost proved prohibitive. Once again the Bureau had to fall back on its own resources and turned the problem over to its technicians for solution.

Finally, on May 29, 1912, the Director was able to report that the machine was then completed and ready for practical use. He further noted that "... it would be possible to launder on one machine a minimum of 20,000 notes a day. . . ." Under actual operating conditions the productive output ranged from 30,000 to 40,000 notes per day. The following month the equipment was turned over to the Office of the Treasurer of the United States for operation.

A graphic explanation of the equipment is found in a letter of September 27, 1912, from the Bureau to the Bank of Montreal, Canada.

This machine utilizes a new principle for washing. Briefly, the note is placed between two endless bands of cloth, which are alternately slid upon each other, creating a microscopic friction which loosens the dirt from the note and is discharged by the water being repeatedly absorbed and pressed out of the bands.

The machine will remove all the dirt that can be washed out by any process of washing. Grease, stains, writing and printing ink, etc., cannot be satisfactorily removed without disturbing the actual printing. Old bills that have the ink in a powdery condition have a faded appearance, but new bills may be repeatedly washed without showing the slightest signs of fading. The washed bills are sterilized and free from any odor.

The machine is self-contained—a bill placed upon the feed table emerges two minutes later, dried and ironed flat. The capacity with inexperienced operators will be 2000 per hour, and 5000 and over has been attained by experts. No skill beyond

ordinary dexterity is required to feed the machine.

Ordinary yellow bar soap and a special germicide and bleach sold as a dry powder is all that is used, a small amount of running water is required with sewer outlet. The machine is entirely gas heated, but can be equipped with steam or electricity, at an additional cost. It requires two horsepower motor to drive it.

The cost of maintenance, aside from labor, should not exceed two or three dollars per day, running continuously. It requires two operators—one to feed and one to receive, and a man with some general knowledge of machinery to make up solutions and take care of the machine, although an inspection once an hour, after getting started, is all the mechanical attention required.

For operating, a space of about three by fourteen feet is required. In warm weather, it should be well ventilated on account of the heat, but there is no objectionable vapor or odor.

The machine is mechanically well constructed, the best materials used—principally brass for the working parts—and is not likely to get out of order. The construction is such that bills cannot be lost in the machine, as once placed in it, they must come out, and they are handled only at the beginning and ending of the process.

A stamp of approval was given the equipment with a congressional appropriation to the Secretary of the Treasury on August 26, 1912 (37 Stat. 595), for the purchase, installation, and operation of additional machines. These were to be installed in the Office of the Treasurer of the United States and various sub-treasuries throughout the country. Accordingly, 12 machines were constructed from designs prepared by the Bureau and purchased under contract at a cost of \$1,250 each. The first of the contracted equipment was installed in the New York

subtreasury on April 27, 1913, followed by an installation in the Chicago sub-treasury the next month. The use of the original machine in the Office of the Treasurer was discontinued and it was replaced with three improved models. In early 1914 installations were completed in the subtreasuries at Boston and Philadelphia.

The laundering practice was short lived, however. With the outbreak of World War I it became impossible to secure adequate supplies of new linen cuttings used in the manufacture of currency paper. The situation necessitated the substitution of cotton for a portion of the linen used and, eventually, the elimination of linen entirely. Since the new paper did not lend itself to the laundering process, it was decided to discontinue the cleansing operation until such time as it was again possible to secure an all-linen product. From fragmentary evidence now available, it appears that the use of the laundering machines, at least those in the Treasurer's Office in the main Treasury building, was discontinued in 1918.

The question of resuming the laundering operation was considered in 1921 when a return to the use of a 100-percent linen content currency paper was being contemplated. However, the U.S. Secret Service was unalterably opposed to the proposition and the matter was dropped. A memorandum of June 26, 1924, from the Acting Chief of the Secret Service to the Commissioner of the Public Debt gives the reasons for this stand.

Numerous and exhaustive experiments have demonstrated beyond question that the washing of paper currency so changes

the feel of the paper and the appearance of the bill as to confuse not only the public generally but even those who are called upon to determine the genuineness of bills turned in for redemption. . . . [Resumption of the practice] would result not alone in bringing our paper currency into suspicion everywhere but would actually lend substantial aid to the counterfeiter.

Rotary Web-Fed Postage Stamp Press

Little was it envisioned that the growing popularity of stamp vending and affixing machines would exert such a phenomenal impact on the production of postage stamps by the Bureau as was later to develop.

With the ever-increasing demands for stamps in coiled form in the early 1900's, it was soon realized that only by eliminating the need to paste the sheets together for further processing could the Bureau hope to keep abreast with the orders for coiled stamps. In 1909 the Third Assistant Postmaster General recommended "that steps be taken looking to a change in the method of printing our postage stamps which will enable the Department to provide this improved service [retail sale of stamps in coiled form at stamp windows]."

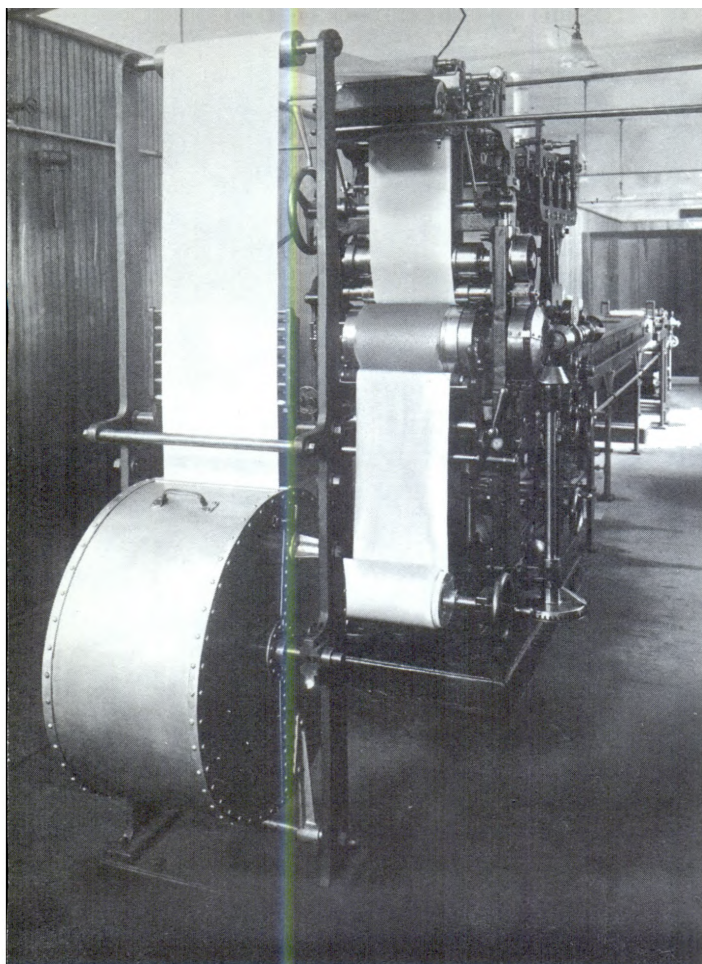
Working on a suggestion for printing the stamps on continuous rolls of paper, Benjamin F. Stickney, the Bureau's mechanical expert and designer, developed plans for a rotary press which would wet the paper stock, print the stamps, gum and dry them, and perforate the work, while in web form. However, the Bureau lacked the funds to finance con-

struction of such a machine. Accordingly, the Post Office Department was approached on the matter. So promising were Stickney's ideas that in 1910 the Postmaster General authorized the expenditure of \$5,600 for the construction of an experimental machine in accordance with the plans, from money appropriated to the Post Office Department for expenses incident to investigating and testing mechanical and labor-saving devices.

Strangely there is little information in the Bureau's records relative to the development and introduction of this machine. No mention is made of the equipment in the annual reports of the Bureau until that of fiscal year 1914 when its use was an accomplished fact. Even that account was kept to the barest details.

A rotary web plate printing press was constructed from plans designed by the mechanical expert of this bureau, and after several years experimenting it is now working satisfactorily. Postage stamps printed in rolls on this press have been made into coils which have for several months been issued to postmasters for sale for use in stamp-vending and stamp-affixing machines. A device for gumming postage stamps has been attached to the press. Four more of the presses have been ordered to be used in printing postage and revenue stamps. It is expected that an annual economy of several hundred thousand dollars will be effected when the printing of postage stamps and of certain revenue stamps has been transferred to these machines.

A clue to the lack of data may be contained in a Bureau memorandum of April 26, 1913, to the Assistant Secretary of the Treasury. Here is given an explanation as to why competition was not invited



Original Stickney rotary web-fed intaglio press
(roll feed end).

for the constructing of the production model press, saying:

Another reason why it is desired to have the work done by the Universal Telegraphic Company⁵ is that while it is competent to execute the work, it is a comparatively small and unknown concern and the press can be constructed without publicity which would probably cause agitation and opposition on the part of the plate-printing trade, which, of course, is opposed to improved machinery for use in the process of plate printing. Also by having the work done by this

⁵ This firm, which was located in Baltimore, Md., had been selected to construct the experimental press in accordance with Stickney's original plans.

firm, which is not particularly interested in the development of printing machinery, there is less possibility of the adoption of any of the basic principles of the machine by outside interests which might cause vexatious difficulties in the matter of obtaining patents for the press.

Fortunately, from a historical viewpoint, the annual reports of the Third Assistant Postmaster General, whose duty it was to administer the procurement of stamps, give more insight into the details of the development of the rotary stamp press.

The confidence expressed by the Post Office Department in financing the construction of an experimental press in accordance with Stickney's plans was well placed. In his report for the fiscal year 1912, the Third Assistant Postmaster General described the stamps printed on the experimental press as being "exceedingly well printed, having a softer and more pleasing appearance than stamps printed with the old method." The machine, however, was not put into actual production, but was used only to test and perfect its mechanisms. As a result of these experiments a pilot model embodying certain structural changes, especially with regard to the drying of the printed strip of paper, was constructed. This time the cost of manufacture was borne by the Bureau and steps were taken to assure that changes were made in its parts which would obviate possible conflict with existing patents on other printing presses.

The aforementioned 1913 Bureau memorandum, in justifying the cost of this pilot machine, throws an interesting light on the potentials of the Stickney press:

The present method of manufacturing postage stamps is to print them on single sheets containing four hundred stamps each on power plate printing presses, then to gum them in single sheets, and finally to perforate them by passing them in both directions through rotary perforating machines. In all of the various processes from the handling of the blank paper to the delivery of the finished stamps in packages to the stock vault, there are necessary twenty-three different handlings, while by the use of the press which it is proposed to purchase, and which has as appurtenances devices for gumming and perforating in connection with it, the number of handlings or separate processes will be reduced to eight, resulting in an annual saving in the manufacture of postage stamps by the use of 8 of these presses, of \$240,000.

In addition to the use of this machine in manufacturing postage stamps, it was believed that when the presses had been put in actual operation it would be found that they could be adapted to other classes of work in the Bureau, with resulting great economies.

It was probably with some pride and great satisfaction that the Director of the Bureau sent invitations in the spring of 1914 to the Secretary of the Treasury, the Postmaster General, the Assistant Secretary of the Treasury, the Third Assistant Postmaster General, the chairman of the Committee on Appropriations of the House of Representatives, and the Comptroller of the Currency⁶ to visit the Bureau and observe the operation of the unique Stickney press. The following letter was addressed to the Secretary of the Treasury:

APRIL 1, 1914

MY DEAR MR. SECRETARY: This Bureau has been experimenting for the last

two years with a rotary intaglio printing press which was designed here and constructed under the Bureau's supervision for the purpose of printing postage stamps from a continuous web of paper and the machine is now perfected and ready to be put into regular daily operation.

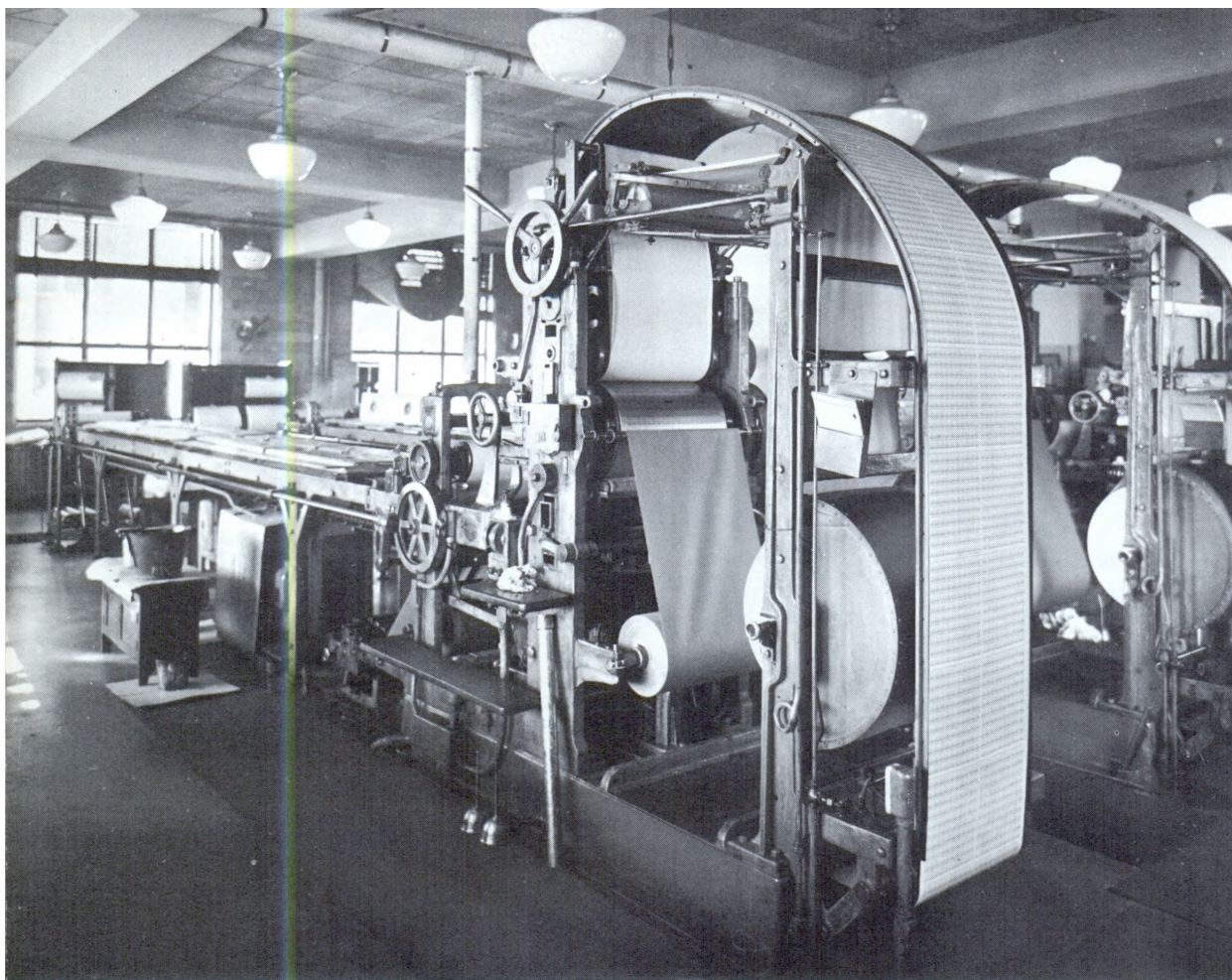
While the desirability of a machine of this character was suggested through the necessity for a more expeditious and perfect manner of preparing stamps in coils for use in stamp vending and stamp affixing machines to avoid the joints which were necessary, due to the printing of the stamps in sheets, and will fully meet this requirement, it is at the same time a revolution in the method of plate-printing, as it has never heretofore been satisfactorily demonstrated that perfect printing could be executed from curved intaglio plates and on paper that had not previously been thoroughly dampened.

* * *

In view of the importance of this development in plate-printing machinery and the possible great savings that will result from its use in the work of this Bureau, I would be very glad if you could find it convenient to visit the Bureau at 2:00 p.m., tomorrow, Thursday, the 2nd instant, to witness its operation.

The distinguished visitors saw a very unusual machine manufacturing 2-cent

⁶ Though the press was originally intended for the production of postage stamps, it was also thought to have potentials for the printing of currency—hence the invitation to the Comptroller of the Currency. An experimental project to print currency backs on the machine was begun in 1918. Although specimen back impressions of \$1 Federal Reserve notes printed on the press were approved by the Chief of the Secret Service in November of that year, the technical problems involved in actual production work proved insurmountable even after experimentation that continued for several years, and the scheme was abandoned.



A battery of Stickney presses, such as the machine pictured here, were used to meet the Nation's postage stamp needs up until the early 1950's. They were gradually replaced by high-speed, web-fed intaglio presses.

postage stamps. At the outset, a roll of paper, just as it was received from the contractor, was placed in a drum compartment at the front of the press and manually threaded through the machine. As the press motor was turned on, the roll unwound and the paper was dampened on one side as it passed over a set of two rubber rollers, one of which revolved in a small tank of warm water and wet the other which served as a distributing agent. Then the paper moved between a set of three rollers in a second trough, the bottom roller serving as a further dampening agent and the top two rollers pressing out the excess water. The

moving web then passed to a printing cylinder equipped with two semicircular engraved plates. These plates had been independently inked, wiped, and polished by the mechanism of the press. As the paper moved past the cylinder, a pressure roller pressed it against the revolving plates, thereby printing the impression. The roll continued to unwind and the printed work was dried as it moved on a heated track to the gumming apparatus. The stamps were gummed as the web of paper passed over a roller which revolved in a trough of adhesive solution. The work then moved through a heated chamber to the far end of the press where it

emerged perfectly dry. Next, it proceeded to the perforating mechanism which perforated the stamps in both directions or in either direction separately, as desired.⁷ Finally, the printed web was rewound into roll form for future processing into coils.

Contrary to the old adage concerning the prophet and honor, Stickney's name became linked with that of the rotary web-fed intaglio press. The machine came to be called simply the "Stickney Press" and, though it has been supplanted by modern versions, it is still so identified throughout the graphic arts field in America and abroad.

The first stamps produced on the rotary press were the 2-cent ordinary variety of series 1911. The initial issue of this work occurred on June 30, 1914. As additional presses were acquired, the production of other denominations of coiled postage and revenue stamps was assigned to the

⁷ Evidently, the perforating mechanism was operated in conjunction with the press for only a short while, since other early descriptions of the Stickney machine do not make mention of a perforating apparatus. It is known that Stickney was working on another perforating device in October 1914. Probably, upon its successful development it was manufactured as a separate and distinct machine.

machines. Encouraged by the reception given the coiled work, the Bureau arranged to procure a larger model of the press to accommodate the printing of stamps from 400-subject plates. This press was installed in 1920 and used for the printing of sheetwork issued to postmasters in 100-subject form.

After the addition of a second of the larger machines, further expansion to the number of presses was delayed because of the numerous complaints received from postmasters concerning the tendency of the sheets to curl and then crack. However, with the addition of a breaker bar to the press in 1924, which ridged the gum as it was applied to the web of paper, the problem was solved to a great extent. By July 1, 1926, all ordinary postage stamps of 10 cents and under were being produced on the rotary presses. With the gradual increases in the quantities ordered, stamps of the higher denominations, with exception of the \$1, \$2, and \$5 values, were transferred from the flat-bed to the rotary press in 1931.

The rotary presses gave Trojan service in the Bureau until they were replaced by electronically actuated web-fed presses. The last of the Stickney presses was decommissioned on March 15, 1962.

CHAPTER V A Bigger Home— an expanded workload 1914–1928

BY 1906 FURTHER EXTENSIONS to the Bureau building were out of the question. The Bureau property, comprising a little more than half of a full city square, was then fully occupied. Supposedly, each addition erected, beginning in 1890, would provide the space for current needs and allow for future growth. However, the expanded facilities proved to be only temporary alleviations. The Nation's economy was on the upsurge. The victory achieved in the Spanish-American War had raised the United States to the rank of an international power. The resultant demands upon the Bureau for more and more currency notes and other securities could be met only by overtime work and the creation of a second work shift. While such steps could be justified economically for relatively short periods of time, they were not practical on an extended basis. The work performed on the night shift required the services of a large force of employees, mostly young women. This was not a desirable situation inasmuch as they had to pass through the lonely park area surrounding the Bureau late at night in order to reach their homes—a fact that was often a point for comment by the local newspapers.

Figuratively the Bureau was bursting at the seams. All available space was being used and there was an overcrowding of machinery and employees in every workroom. For instance, in the main plate printing pressroom, comprising some 9,000 square feet of floorspace, there were

224 hand presses with a gas stove and a work table attached to each machine. A report of the times relates that the presses in this room were "so close together that there is but a few inches of space between the handles by which they are operated" Extreme care had to be



An 1898 view of the main plate printing pressroom at the time of the Spanish-American War. Note the Cuban flag on the machine just back of the printer to the left, in the black shirt. "Air conditioning" consisted of a series of paddles located at ceiling height which were motor driven to circulate the air in the room.

exercised lest in passing among the presses a person might be struck by the long radial handles or be burned. Here 470 employees worked in close proximity. The heat generated by so many gas stoves created an atmosphere that was anything but pleasant, particularly during Washington's hot, humid summer months. The report goes on to state that "similar conditions exist in many of the other [work] rooms."

Another situation to be contended with was the wide dispersal of like activities throughout the building and the consequent lack of centralized operations. In all, there were eight plate printing press-rooms, located on five different floors. These workrooms had been set up as the various extensions to the building were completed and though it was realized that the situation was far from ideal it was felt that they were "as well located as the arrangement of the rooms will permit."

Already overcrowded and pressed to meet the demands for increased requirements for currency resulting from the natural growth of the country, the Bureau viewed with apprehension the growing movements which advocated a more frequent redemption of currency notes and a more elastic currency system. If Congress should approve either of the proposals, the Bureau would be sorely taxed to meet the increased requirements—should both ideas be adopted, the result would be catastrophic.

It was in the light of this background that the Director felt compelled to close his annual report for fiscal year 1906 in the following manner:

I have the honor, therefore, to recommend that Congress be urged to provide

an entirely new building for the Bureau, to be designed and constructed for its special needs. It is believed that with the experience of the last twenty-five years a building can now be designed in every way adapted to the work, having the rooms for the several divisions conveniently grouped with reference to the work executed in each and to the administrative offices, and embodying all of the improvements in building construction and in the operation of machinery, including electric light, power, and other processes that have been developed during that period. . . .

The initial step toward improving the situation was the granting of a \$5,000 appropriation (34 Stat. 1306). This act was interpreted as authorizing the Secretary of the Treasury to have plans, specifications, and estimates of cost prepared for (1) the purchase of a site and the construction of a new building; (2) the remodeling and extension of the building then occupied; and (3) the purchase of the privately owned property within the square where the Bureau was located as well as the two adjoining city blocks immediately to the south, on which to construct an additional building or buildings as necessary.

A report covering these propositions was submitted to the House of Representatives on February 12, 1908. After carefully considering the ramifications of each proposal, the Department recommended that "Congress authorize the construction of an entirely new group of buildings."

In developing Plan No. 1, prime consideration was given to the need of the engraving operations for an abundant north light required in executing the delicate and detailed work of the craft.

Consequently, the objective in this instance was the selection of a site that would give the greatest expanse facing north. It was believed that an ideal site for the purpose would be a tract of land bounded by 17th, 18th, D, and E Streets in the northwest section of Washington.¹ The location had the added advantage of being close to the Treasury proper, which would eliminate long hauls between the two buildings. It was proposed to erect three structures on the site. The largest would be rectangular in shape with a center court. The main portion, comprising five stories and an attic, would be devoted to production activities. Within the court would be a smaller building to accommodate the engineering and machining operations. A third structure for housing the stables, ink mill, and macerator was to be located some distance from the others to separate the dust and disagreeable odors of these activities from the main building.

Plan No. 2 provided for the remodeling of the old Bureau building and the erection of a four-story-and-attic addition to the structure. Since the second provision of the congressional act made no mention of acquiring additional land for the purpose, it was presumed that the extension was to project onto the public park land lying directly north of the existing Bureau building. The proposed addition would cover a ground area of 32,000 square feet and would stand four stories and an attic high. However, it was felt that this proposal would be objectionable since it would project a factory-type structure into

the park area and would be incompatible with the classic design of the neighboring Department of Agriculture buildings. It was further believed that this arrangement would be unacceptable to the general public and prove to be a constant cause for adverse comment and criticism.

The third plan provided for the erection of an additional building on land south of the site then occupied. The proposed structure would be rectangular in shape, three stories and an attic high, with two center courts. If a building were located on this site, the first point to be determined would be the method of access between the two—through the open streets or by tunnel. The carrying of securities back and forth through an open area would be insecure and expensive. Access by tunnel would not be practical because the foundation of the south outbuilding intervened between the Bureau proper and the proposed site. Even if it were possible to install a tunnel, there would still remain the problem of lack of centralization of like operations. There was also the drawback that if the plan were adopted, it would be necessary to demolish the laundry and stable located in the northwest corner of the site and to provide for replacement of such facilities.

Apparently this report was most thought provoking, for 1 month later the Speaker of the House of Representatives and the chairman of the House Committee on Appropriations visited the Bureau for the purpose of determining what relief should be granted. A report concerning this visit states:

They made a thorough inspection of the main and the outbuildings, and were very much impressed with the necessity for

¹ The national headquarters buildings of the American National Red Cross are presently located on this site.

additional room in which to execute the work of the Bureau. They were, however, strongly disposed to retain the present building, and to provide for additional room by way of a new building to be located on the public park where the green houses² are now located, west of 15th Street, and south of the road that runs through the Monument Park in front of the Bureau building.

They practically intimated that unless this proposition be accepted, no relief would be granted. On leaving the building, they requested that an estimate of the cost of the additional building located as indicated, and providing for the present necessities of the work of the Bureau, with allowance for a reasonable increase in the future, be submitted.

The decision to erect the addition on the site of the Propagating Gardens was prompted by the fact that the land in the area of 17th and D streets had been the subject of a great deal of real estate speculation and for this reason the site favored by the Treasury Department was rejected.

The specially requested report was immediately prepared and submitted to Congress. This proposal called for a building 300 by 500 feet, with interior courts, basement, four stories, and an attic to be erected at an estimated cost of \$2,200,000. The House Appropriations Committee gave immediate consideration to the proposal and that group was about to report out a bill incorporating essentially the same elements as contained in the special report when the committee chairman was informed that the President would veto any proposal to remove the Propagating Gardens. The bill reported upon and

finally enacted on May 27, 1908 (35 Stat. 319), granted the sum of \$250,000 for the purchase of the necessary land and established a limitation of \$1,900,000 for construction of a new building. The act further specified that the building should be erected on the grounds immediately to the south of the site of the Bureau. The features of the bill were the same as had been proposed in Plan No. 3 of the three-point report of the previous February, except that the structure would be large enough to serve as a replacement for, rather than an addition to, the original Bureau building.

It appeared that at long last the Bureau was well on the way to obtaining a plant that would meet all its requirements. But fate seemed to rule otherwise. All the bids received in connection with the erection of the new building exceeded the amount of money authorized by Congress for the purpose. The plans had to be discarded. One after another, alternate solutions were considered and then rejected for a variety of reasons—one proposed layout would not accommodate all the necessary machinery; another did not readily lend itself to possible future additions; the next would extend the buildings onto ground that would require the use of pilings to an extreme depth; another also proved too expensive to be accomplished within the money limitation; the fifth would require the retention of the old building, a factor that would be most unsuitable. Finally, a set of plans was developed that provided for an arrangement suitable to the work requirements in a structure of esthetic appearance and proportions and at the same time proved to be feasible from the standpoint of cost.

² These greenhouses were part of the Public Buildings and Grounds Propagating Gardens administered by the Corps of Engineers, War Department.

Fortunately, Congress had seen fit to raise the cost limitation to \$2,300,000 in August of 1911 (37 Stat. 34).

Accordingly, a construction contract stipulating a completion date of May 1, 1913, was entered into on November 17, 1911. But here again fate stepped in to take the upper hand. Erection of the steel superstructure was delayed because of the lack of fabricated steel girders and a siege of inclement weather that gripped the city. Finally, the difficulties were overcome and the tremendous task of moving the operations from the old to the new building was begun on February 24, 1914. The new Bureau was formally occupied on March 19 when Old Glory was raised from the staff heads located at the north and south ends of the building.

The architectural style of the building is Roman Doric. It is of steel superstructure with concrete fireproofing and is constructed of reinforced concrete faced with Indiana limestone and granite trim. Along its main facade, fronting on 15th Street and overlooking the Tidal Basin, is a series of stone columns spanning the entire 505-foot length of the building. Four factory wings extend a distance of 296 feet back toward 14th Street. In all, the structure contains approximately 10 acres of floorspace. It is 105 feet in height and comprises a basement, four stories, and an attic. It cost \$2,882,000.

The frustration of the delay in getting the building underway was tempered to an extent by comments of the Commission of Fine Arts in a letter of February 15, 1911, approving the design:

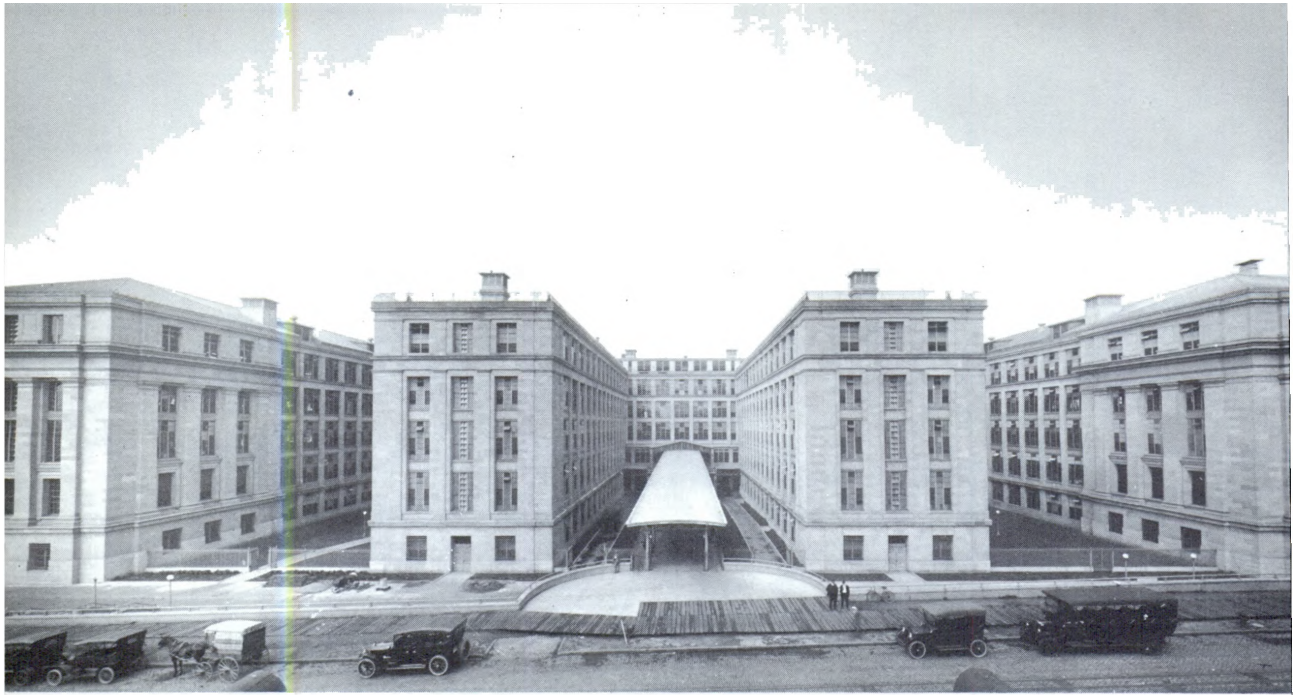
The modified design for the building is highly satisfactory, and the commission



Howard F. Ralph shown with his father, Director Joseph E. Ralph, raising the flag on the north end of the building on the occasion of the formal opening of the new Bureau building on March 19, 1914. The other boy, Frank Ferguson, son of Assistant Director Frank E. Ferguson, had the honor of raising the flag on the south end.

congratulates the Treasury Department both on the type of architecture selected and also on the dignified and even noble manner in which the design has been carried out. The result should be gratifying in a very high degree.

The finished result was indeed gratifying; the discouragements of the past 6 years soon faded in the light of the ensuing praise for Uncle Sam's new money factory. The Bureau was the subject of



The Main Bureau building at the time of its completion in 1914. This photograph was taken from the rooftop of one of the houses located on the east side of 14th Street, now the site of the Bureau Annex.

numerous feature articles in the leading newspapers and popular magazines throughout the country, even some 10 years later. A good case in point is the full-page advertisement published in a Washington, D.C., newspaper in November 1927—one of a series relating to local industries and sponsored by a businessmen's association—which carried a picture of the Bureau and stated:

In Washington there is an industrial plant—a factory which for services rendered is unmatched anywhere in the world. As seen from the Mall, its stately proportions mark the Bureau of Engraving and Printing as a building of symmetry and beauty. And yet for size, number of employees, and value of output it is the world's premier printing establishment.

It is in reality a huge factory, in which are housed many processes ranging from the treating of paper to the design of delicate engravings.

Supply Problems

War broke out between Austria and Serbia in July 1914. Soon almost all the major European nations were engaged in, or fell victim to, the conflict. Germany and England established naval blockades of each other's country to prevent the importation of needed supplies as well as the exportation of commodities that would aid in the financing of armaments. Month by month the situation became more involved and as a result many supplies needed by the Bureau which were imported from Europe became very difficult to obtain. The shortage situation created by the war was particularly acute regarding dry colors for inks. Principally affected were those of red and blue which were available only from Germany in the quantity and of the quality suitable for maintaining the Bureau's standards.

A chief factor relied upon as a deterrent to the counterfeiting of U.S. securities

has always been the manufacture by the Bureau, according to secret formulas, of the inks used in printing its products. The protection of money and stamps was seriously threatened by the shortage.

As a result of prompt action at the outbreak of hostilities, the Bureau secured all the stocks of red and blue dry colors then available from commercial suppliers in Philadelphia and New York, but it was evident that the quantities obtained would not be sufficient for more than 6 months. Through diligent search the Bureau was able, from time to time, to purchase from other sources additional quantities of dry colors which through some means had been permitted to reach the United States from abroad. These tided the Bureau over the remainder of the year. In August 1915 another respite was gained through the personal solicitation of the Director in procuring small stocks from various importers located on the eastern seaboard. However, the imminent situation created great concern since it was realized that in the future it would be necessary to secure all the supplies directly from abroad. With this in mind, the Director requested that the Secretary of the Treasury discuss the matter with officials of the State Department to see if it would be possible to negotiate with known suppliers of dry colors in Germany for direct procurement from that country. The urgency of the request brought immediate action by the State Department. The American consul general in Berlin was notified. He in turn contacted various manufacturers to determine who could supply the requirements and what the prices would be.

After several days of anxious correspondence, an order was placed with the firm of Gebrueder Heyl & Co. of Charlottenburg at prices considerably lower than those last paid in this country. A notice dated January 31, 1916, stated that the German Government had issued the necessary permit for exportation of the materials and that deliveries would commence on February 1. The British Government had previously guaranteed that these shipments from a neutral port would not be interfered with and had so notified its consul general at Rotterdam in the Netherlands, the port selected as the point of shipment. The stage was now set. Anxiety in the Bureau was at a high pitch. As the stockpiles dwindled, trepidation grew. Finally, on February 16, 1916, the first shipment comprising 90 casks of blue and red dry colors left port aboard the steamer *Oosterdyk*, reaching New York early in March.

On its return to Rotterdam the steamer was reloaded and its next cargo included 164 additional casks of what the Bureau had come to regard as very precious materials. Regular shipments continued to be made during the year, but not without some exceedingly tense moments. The British consul general at Rotterdam occasionally questioned whether the Bureau had exceeded the tonnage authorized in the guarantee of uninterrupted shipments and, as a result, the Director was in almost constant contact with the British Embassy in Washington relative to the matter. Sometimes the supplier was doubtful as to whether he would be able to furnish the quantities requested, but deviations were very minor. So successful was the venture that by November 1916 the Director

reported to the Treasury that the supply on hand, including the order then in process, would be sufficient for a year or more. Actually, the supplies lasted almost 2 years.

Meanwhile, alarmed by the fact that the Bureau still found it necessary to import dyestuffs in spite of the growing ink supplies industry in this country, the American Chemical Society formed a committee to ascertain whether any domestic manufacturers were in a position to meet the Government's requirements. The Bureau cooperatively furnished its specifications for the dry colors needed and an estimate of the yearly consumption of the items. Evidently the society was successful. In response to an offer received late in 1918 from a commercial firm in Holland to sell prewar stocks of German blue dyes, the head of the Bureau's ink making division replied that he was "able to purchase a very satisfactory American made product at a price no greater than the one quoted. . . ." Today, all the dyes used by the Bureau in the manufacture of inks are products of domestic concerns.

Liberty Loan Bonds

Probably the greatest combined effort in the Bureau during the war years was displayed in the printing and processing of the five issues of Liberty Loan bonds. This achievement has been referred to as gigantic and tremendous—and justly so—for the magnitude of the task can be realized only when it is known that more than 100 million bonds were printed, numbered, and controlled through the various operations during the period of

their production by the Bureau from April 1917 through the early spring of 1919.

The first Liberty Loan bond issue called for the printing of more than 6 million bonds. Although there was some delay in their issuance, due to the suddenness of the need and the lack of a sufficient number of employees to handle such an increased production program, the obstacles were surmounted. The Liberty Loan issues definitely placed a heavy burden on the existing work force, and coupled with this program were other war-financing measures which could not be handled without additional personnel. The creation of the Federal Farm Loan Board by an act of July 17, 1916 (39 Stat. 360), required the printing of interim certificates and charters for the Joint Stock Land banks and the National Farm Loan associations. War savings stamps and savings certificates were introduced. Orders for huge quantities of certificates of indebtedness, increased orders for various classes of currency notes, and the adoption of certain revenue measures for which stamps were required comprised a heretofore unmatched demand on the Bureau's manpower, equipment, and machinery. In order to accomplish the task it was necessary to work on a 24-hour daily schedule and to secure the services of some 1,200 additional workmen and clerks. By order of the President, permission was obtained to waive Civil Service Commission regulations in recruiting the needed help. This deviation was purely an emergency measure; the order was meant to be revoked as soon as the necessity for it had passed. Unknown at the moment was the fact that this war-time decision would continue in effect



Secretary of the Treasury Carter Glass removing the first Victory note from the press.

for more than 3 years. Bolstered by this Executive order, Bureau officials engaged in an unprecedented recruiting program. Teams of crafts representatives were dispatched to various cities in the East, where their particular trades were known to flourish, to recruit the services of any qualified person within the trade who would be interested in Government employment. Position opportunities were advertised extensively through the medium of newspapers and trade journals; assistance was requested of various trade unions and the printing industry was canvassed to secure the services of craftsmen who might be willing to accept appointment, even for as little as 90 days. With the additional help acquired through these means and the continuing long hours, the Bureau was able to keep pace with existing orders.

Because of America's thrust into the war there had been little time for advance planning in connection with the first Liberty Loan drive. The Bureau

was still staggering under the load demanded by that issue when the second drive was announced to begin on October 1, 1917. The Treasury found itself swamped with orders for purchases of the bonds of the two loans. As a result it was decided to issue anticipation interim certificates and bonds of a temporary nature until such time as they could be replaced with standard bonds. The Bureau was called upon to produce the "special" securities.

In desperation the Director called a meeting of the representatives of the various printing trades within the Bureau to discuss methods by which production could be increased. One of the most significant achievements emanating from this meeting was the mutual agreement that power plate printing presses must be fully utilized if the Government was to be provided with the needed war-financing securities. It was also decided that additional classes of revenue stamps should be printed by the offset method,

thus releasing power presses for producing other plate printed work. If these power presses had not been made available it is doubtful that the 17,363,000 bonds needed for the second Liberty Loan issue could have been delivered on schedule.

Having become accustomed to handling the orders for such large quantities of bonds, the Bureau was able to cope with the demands for the more than 25 million items required by the third loan and the 38½ million of the fourth issue. Deliveries of these items were made to

coincide with the established sales dates. The fifth loan, better known as the Victory Loan, was also expedited in such a manner as to promote on-the-spot issue at the time of sale. As previously stated, the original issue of the five loans comprised over 100 million bonds. Add to this the more than 8 million conversion bonds and a like number of interim certificates delivered through June 30, 1918, and one can readily understand why this war-financing measure had such a tremendous impact on the Bureau's production efforts. This feat was described in

"Washington went 'over the top' with its quota of the Victory Loan and last night thousands assembled on Pennsylvania Avenue and celebrated this event with one of the most spectacular and frolicsome festivals ever witnessed here. . . . The prize for the most unique car advertising the Victory Loan went to the Bureau of Engraving and Printing. The machine contained a small printing press with which men were printing Victory Loan notes and holding them up for the spectators to see."

—THE WASHINGTON POST, May 9, 1919.



Labert St. Clair's book, *The Story of the Liberty Loans*, as "the most stupendous task of its kind ever accomplished in the history of the world."

Photolithographic Offset Printing

The greater portion of printing in the Bureau has always been accomplished on plate printing presses. Yet, almost from the very first days of operation, use has also been made of flatbed typographic cylinder presses, the type of machine found in any ordinary printshop. Stereotype plates and electrotypes were used for the letterpress printing required by the various Civil War financing issues. The output of the typographic presses through the years has been confined, to a great extent, to the overprinting of plate printed work, but some internal revenue stamps have been produced on these machines.

It was not until 1912 that a third type of printing, a branch of lithography known as photolithographic offset printing, was performed by the Bureau. An act of August 24 of that year (37 Stat. 430) nullified the legal requirement that all checks and tints for securities be printed on hand roller plate printing presses and left the method of producing these two classes of work to the discretion of the Secretary of the Treasury. Accordingly, the Bureau procured two used offset printing presses for the purpose—a step which within 5 years was to prove fortuitous indeed.

Offset printing was comparatively new in the graphic arts industry. The president of the International Printing Press-

men & Assistants' Union of North America in a letter of May 1913 to the Secretary of the Treasury relative to the installation of this type of equipment in the Bureau stated that the "offset press was not known, or at least not generally known, prior to 1900." Though the innovation proved to be an economical venture, it was still regarded in the Bureau as being in an experimental stage until America's entry into World War I. Admittedly, the process had been satisfactorily used by the Bureau in the production of certain internal revenue stamps required by an act of October 22, 1914 (38 Stat. 745), the first to be produced in this manner. The legislation called for the issuance of these stamps within a short time after its passage; in fact, some were needed as early as November 1. In all, some 5 million sheets of stamps were required and it would have been impossible to produce them in time by any method other than the offset process in a manner that would afford the needed degree of security and satisfactory designs. However, the use made of the process was limited and it was only because of the astronomical quantity of Liberty Loan bonds required by the war that additional offset presses were procured for printing the tints for these bonds. It was in this instance that the method proved its practicability and efficiency, and thereby became firmly established within the Bureau.

Many improvements had been made in lithography since the days of the cumbersome stone plates employed by Johann Senefelder who discovered the process in 1796. At the time of the introduction of the offset presses into the Bureau, the lithographic printing medium used was

a zinc plate which carried a photographic image of the impression to be reproduced. The design was composed of a thin layer of a hardened chemical solution adhered to the surface of the metal whence the plate derived its name, planograph. The press took its name from the fact that the impression was first taken up on a revolving, rubber-coated cylinder from which it was offset on to the paper.

The application in the Bureau was naturally limited because offset printing did not afford the same security protection as intaglio printing. For that reason the offset process was used only for printing securities of a type which would hold little appeal for counterfeiters. Nevertheless, the innovation brought about an annual savings of \$30,000. The advantage of the process lay in the fact that it was capable of producing a clear, sharp impression at a very high rate of speed. While the plates could be manufactured at a relatively low cost, they were serviceable only for 1 or 2 days' straight running, or an average of 60,000 impressions. Steps were taken to see whether this life factor could be improved. As a result, the use of deep-etch offset plates was begun in 1924. These were also manufactured by a photomechanical process, but the design was cut, or etched, into the plate by a corrosive chemical action. The term applied to the plate was a bit of a misnomer, for actually the etching was only approximately one-thousandth of an inch.

The underlying theory of lithography is based upon the physical principle that water and grease do not mix. Consequently, the process involves keeping that portion of a plate not to be printed damp-

ened with water and a mild acid solution, which in turn rejects ink. The principal drawback to offset printing was that the dampening agent eventually caused a deterioration of the design of the plate.

Planograph and deep-etch plates were used by commercial printing establishments long before the Bureau adopted the use of such plates. However, it was through the efforts of Bureau personnel to overcome the limited life-use factor caused by the destructive action of the dampening agent that a third type of plate was developed—the high-etch plate. Truly, this plate is a Bureau contribution to the graphic arts industry. It was conceived and perfected here and is in use today throughout the printing trade. The plate is manufactured in essentially the same manner as the deep-etch plate, but the design is in relief with the background etched away, rather than vice versa. The need for a dampening agent was eliminated and the life of the plates was extended appreciably.

The average life of high-etch plates during the first year of their use in the Bureau was 12 million impressions. Through the years various improvements were made in the quality of these plates and as this progress was achieved, the scope of work produced therefrom was expanded, reaching its zenith during World War II. The "DeWitt Clinton stamps" that were used on all packages of cigarettes until June 1959 were produced from high-etch plates in quantities that stagger the imagination. The tints of the more than a billion savings bonds produced during the defense and war periods of the early 1940's were likewise printed from this kind of plate. Today, with

the discontinuance of many classes of internal revenue stamps and the conversion of Government checks and transportation requests to punchcard forms, the variety of offset work produced by the Bureau has been considerably curtailed. However, bottled liquor strip stamps, covers for stampbooks, and miscellaneous certificates continue to be produced in huge quantities from high-etch plates.

Offset Printed Postage Stamps

In the desperate attempts made during World War I to keep the Bureau's supplies of raw materials at safe levels, it was often necessary to accept items of an inferior quality and to rely upon the ingenuity and resourcefulness of Bureau chemists and research personnel to bring the products up to standard. Some of the inferior products could not be satisfactorily remedied and others could be altered only sufficiently to meet the minimum requirements. It was strictly a touch-and-go situation.

An item of constant use in the manufacture of Bureau printing inks was a substance called barytes. It was a derivative of an earthy rock which after refining and grinding was used as an extender for the coloring material in the inks. In the early part of 1918 the Bureau received a shipment of barytes which was to bring about a drastic, though temporary, innovation in the production of U.S. postage stamps. The samples chosen from this lot for test purposes passed the basic requirements for the item, but it later developed that a large quantity of the total supplied was below standard and the inks manufactured with that por-

tion contained coarse particles which caused the intaglio printing plates to wear rapidly. In some cases plates wore out in 10 days, whereas their normal life expectancy was from 6 to 8 weeks. The coarse barytes had been used in the manufacture of the purple ink employed in the printing of the 3-cent ordinary postage stamp. Requirements for this denomination were running about 25 million stamps each day. This was an unusual demand resulting from an increase from 2 to 3 cents in the domestic letter rate that had become effective on November 2, 1917. Because of the excessive wear of the intaglio plates and the fact that replacements could not be supplied fast enough, production of the 3-cent denomination was less than one-half the required amount and the Bureau's stock of this stamp was becoming alarmingly depleted. The Director requested permission from the Post Office Department to resort to the offset method for printing this item as an interim measure. This was not an unreasonable request in the light of the seriousness of the situation. The Bureau had previously experimented with the offset printing of postage stamps in 1910 in connection with its efforts to manufacture stamps suitable for use in dispensing machines. Based on the findings of these tests, it was known that an acceptable stamp could be produced by the offset method.

The Postmaster General, realizing the importance of the 3-cent stamp to the needs of the public and the confusion that would result if the stamps were not supplied in sufficient quantity, acceded to the request on March 9, 1918. The necessary offset plates were hastily prepared and

printing was commenced on March 12. The first delivery of the offset printed stamps was made 10 days later. It was then observed that the plates for printing the 1-cent ordinary stamp were also wearing very rapidly and permission was obtained to print the stocks of that denomination on offset presses. Thus another "first" was recorded, but it was only a temporary change to prevail until a sufficient supply of new intaglio plates could be made. A similar situation developed in March 1920, which ironically enough was shortly after the first-class domestic postal rate was reduced to its prewar level. At that time it was the printing of 2-cents stamps that necessitated the same treatment and, as before, it was a poor quality of barytes that caused the trouble.

These are the only three instances in which U.S. postage stamps have been printed in their entirety by the offset method.

Space at a Premium

The efforts to obtain additional and suitable workspace for the expanding Bureau activities had culminated with the completion of the new building. At that time it was believed that the structure would provide sufficient space for any future expansion of activities for some years to come. Little was it anticipated that within the short period of the next 3 years there would be a dearth of workspace³ brought about by America's entry

³ By Nov. 7, 1918, there were 8,432 persons on the rolls, the highest number ever employed during the Bureau's 100-year history.

into the war. Some consolation lay in the fact that if the new building had not been a reality, the situation would have indeed been chaotic. Two operations particularly affected by the space shortage were the examining and surface printing functions. In the examining division the situation became so critical that the area normally occupied by the supervisory and clerical forces was taken over for processing the work, and the preempted groups were moved into the corridors. Equipment was also set up in the hallways to accommodate the tissue separators and counters. Since the building was closed to tourists, the visitors' galleries in the division were likewise used for examining operations. Three shifts were formed to work around the clock, 7 days a week. By December 1918 there were almost 1,500 employees assigned to the examining division, a threefold increase in personnel for that component. Security checks which were not of the utmost importance had to be sidetracked temporarily to expedite processing. The sizing operation was abandoned in order to release experienced personnel for more important duties, even though it was recognized that eliminating the process would have an adverse effect on the wearing qualities of currency notes. But war-financing securities were the most important products at that time and were, therefore, the objects of first concern.

The surface printing division was unprepared to cope with the staggering workload channeled in its direction. First, it was necessary to acquire additional machinery and equipment to be used in processing orders for work never before performed by that division. Additional

offset, flatbed, and cylinder presses were installed. Hundreds of numbering machines for use on printing presses were purchased wherever they could be secured—action that was later to plague the Bureau in connection with baseless charges concerning the fraudulent duplication of bonds. The offset method of printing had been tried previously in the Bureau only on an experimental basis, but the process had advanced to such a stage as to demonstrate its practicability and efficiency. Consequently, when the plate printing division became swamped with orders, some types of work previously printed on power plate printing presses were converted to the offset printing method. A notable change in this regard was the printing of the tints for the Liberty Loan bonds. This new function, in addition to the overprinting and numbering of the war bonds, interim certificates, and certificates of indebtedness and the printing of various internal revenue issues, completely overtaxed the facilities of the division. It therefore became necessary to resort to securing outside help in meeting the needs of the Government. In June 1917 the Bureau arranged with the Huebner-Bleistein Co. of Buffalo, N.Y., to prepare offset plates for the printing of a new issue of postal savings certificates required by July 1, 1917, as well as parcel post tax and documentary stamps in anticipation of a new war revenue bill. The work was printed by the Niagara Lithograph Co. in Buffalo under the supervision of a Bureau representative. In addition, 10 employees were detailed from Washington to the printing plant to handle and safeguard the finished stock.

The work was transferred to the Bureau for final processing and delivery.

The legality of having this work done outside the Bureau without specific congressional authority was seriously questioned during the hearings held by the subcommittee of the House Committee on Appropriations on July 16, 1917. Accordingly, the following day the Director telegraphed a work stoppage order to the lithograph firm. At that time the orders for documentary stamps had been nearly completed with the delivery of some 500,000 sheets to the Bureau. The company had also produced approximately 35,000 sheets of the parcel post tax stamps⁴ and a small quantity of the postal savings certificates ordered. A later request for authority to resort to outside help in instances where demands for printing exceeded the capabilities of the Bureau was not granted. However, the printing of postal savings certificates was later resumed by the Niagara Lithograph Co. on the basis of a contract made with that firm by the Post Office Department.

Wartime Personal Effort

Outward demonstrations of the patriotic spirit of Bureau employees have been displayed by their active participation in many civic undertakings through the years. Perhaps the most notable was the very large turnout that took part in the Flag Day parade in 1916 when some 4,000

⁴ These stamps were never issued inasmuch as the Bureau of Internal Revenue later decided to use documentary stamps as evidence of the tax paid on parcel post packages rather than introduce a specially designed stamp for the purpose.



A contingent of women employees of the Bureau who made up a 400-member marching unit in the Preparedness Parade of June 14, 1916.

Bureau employees were part of an estimated 60,000 persons who marched down Washington's famous parade grounds, Pennsylvania Avenue, behind President Woodrow Wilson in a demonstration of American preparedness. The President himself established a precedent when he led the parade on foot from the Capitol to the White House in what was described as "one of the grandest spectacles ever witnessed in the National Capital." The Bureau contingent, in addition to its marching units, included six decorated floats, one of which was declared by a local newspaper as among "the most elaborate in the whole parade."

The war encouraged Bureau employees toward extra effort—not only in matters affecting production but also in cases where need was evinced for unselfish helpfulness to the country during that critical period. For example, in the early part of 1917, when it was apparent that the appropriations received from Congress would be insufficient for that fiscal year and a remedial deficiency bill had failed to pass the Senate, the employees indicated their willingness to continue on the

job regardless of the fact that payment of their wages might be delayed for some time. Also, in the previous year when a fire had done extensive damage to a portion of the Bureau plant, 160 employees worked continuously for 36 hours to have the damaged area in condition for operation on February 23, even forfeiting their previous day's holiday. The Secretary of the Treasury gave recognition to this particular display of cooperativeness by writing a personal letter of commendation to each employee concerned.

The gigantic job of supplying the needed Liberty Loan bonds is a tribute to the efforts of all employees who willingly did "their part" in producing the securities. Appreciation of this task is enhanced when it is considered that these same employees purchased more than \$1,308,000 worth of bonds and stamps during the various bond sales drives.

Bureau personnel were prominent in volunteer work during the war. Realizing the extensive needs of the American Red Cross, a group of "Bureau girls" completed 15,500 garments and prepared



The Bureau's prizewinning float in the 1916 Preparedness Parade. The decorative theme was "Protection of American Womanhood," symbolized by the figure Liberty towering over a group of women and children and surrounded by armed sailors and soldiers on guard.

many surgical dressings for the society's use overseas. On the home front, two units of the binding division distinguished themselves by their active interest in the welfare of the injured soldiers in Walter Reed Army Hospital here in Washington. All these activities were aside from their regular duties in the Bureau, which in themselves would seem overwhelming.

A Bit of Nostalgia

"Time and tide wait for no man" and that goes for horses too! The Bureau's one remaining horse must have been very

lonesome and somewhat chagrined in the presence of the electric and gasoline vehicles which, shortly after the war, had taken the place of prominence in the stable where his kind was once king. There was little for him to do, since all wagons, carts, and carriages had been disposed of and motorized trucks were being used to make deliveries of the Bureau's products. Even the lawns around the buildings were being mowed by other than horse-drawn machinery. Transportation equipment comprised 22 vehicles. The first mechanized truck procured by the Bureau was an electrically driven

vehicle manufactured by the Studebaker Brothers Co. of New York City. It was received at the Bureau during November 1910. On November 15, an application was submitted to the Commissioners of the District of Columbia for a permit to allow one Thomas E. Skinner, a Bureau employee, to operate the truck. The application described him as being experienced in the operation of electrical vehicles and "thoroughly competent to operate the machine. . . ." Additional mechanized equipment was acquired through the years and finally on July 1, 1920, old "Prince," the lone survivor of a once large group of horses, was sold at auction for \$75. The stable division became a name in history, giving way to the more appropriate title of garage division.

Postwar Years

Many of the innovations adopted during World War I, primarily as emergency measures, proved to be so successful in operation and economical in cost that they were continued after peace was resumed. Of particular note was the increased size in the back-and-face currency plates from four subjects to eight subjects each. The printing of currency backs in 8-subject sheets commenced on July 26, 1918, and the faces were first similarly printed on August 1. Checks which were previously handled in 5-subject sheets were increased to 15 subjects. Government transportation requests were doubled from 5 to 10 subjects a sheet. All these changes resulted in sizable economies and provided for greater production than would otherwise have been possible. Other innovations included a revised cost account-

ing system which enabled the Bureau to determine costs specifically by operations, measure the efficiency of the individual organization, and compare variations in cost of labor, materials, and overhead. Any deviations were readily identified and the proper remedies applied. Reorganizations in some divisions released personnel for utilization in areas of greater need.

It would seem that with the signing of the Armistice in 1918 there would have been an immediate end to the staggering workload and demands on the Bureau facilities, but this was not the case. Printing orders continued to be received for conversion bonds for the various Liberty Loan issues, both permanent coupon bonds and registered bonds, and for replacement bonds of all issues. While the requirements for some war-revenue stamps decreased, those for domestic revenue items were increased; this more or less stabilized revenue stamp production. The Treasurer of the United States requested an enormous increase in the delivery of U.S. notes, mitigated in part by a reduction in the requirement for silver certificates. A notable achievement of the Bureau during fiscal year 1919 was the manufacture of dies, rolls, and plates in connection with the printing of a new issue of Federal Reserve Bank notes. Deliveries of these new bills during that year exceeded 56 million pieces. And so it was, the end of the war eased the tension and reduced the necessity for pinpoint time schedules but the Bureau continued to produce at a grueling pace. The worst was over and the challenge had been met. The achievements will long be remembered.

The period immediately following the

war was considered one of emergency, and special measures were necessary to meet the requirements of existing orders. Lack of space and equipment made it necessary to operate some divisions on three work shifts daily so that all machinery could be fully utilized. Wooden temporary buildings in Potomac Park, adjoining the Bureau, were used for storage purposes, as were several small, Government-owned buildings between the Mall and Pennsylvania Avenue. The Bureau had been in its spacious new building only 5 years but already it was becoming overcrowded.

Advancements realized through the introduction of the electrolytic process for the manufacture of intaglio plates were matched by improvements in the production of offset plates. The latter achievement was of particular importance to the rapidly growing program of printing internal revenue stamps. The photolithographic section which manufactured these plates was completely reorganized and modern equipment was obtained.

Fiscal year 1921 proved to be a stabilizing period. The acquisition of 50 power plate printing presses as additional equipment and for replacement purposes brought the total to 243 power presses in use. This, along with the termination of the printing of Liberty Loan bonds in April of 1921, except for those needed for exchange or replacement purposes, tended to taper activities back to the normalcy of prewar years. The production rate was still 50 percent over that of prewar output, but the modernization of equipment and successful experimentation had placed the Bureau in a position where it could produce more in a shorter span of

time. During this period the midnight shift, begun during the war, was discontinued and the Executive order which permitted the Bureau to waive Civil Service regulations in recruiting personnel was rescinded, with the result that the Bureau was once again subject to all rules and regulations of that agency. There were some peaks and valleys in production schedules. Soon there was a definite leveling off of production requirements and it became necessary to reduce the work force to a more realistic number in relation to the workload. Between January and September 1921 the force was decreased by some 1,200 employees. Most of these separations were initiated as indefinite furloughs, but were later changed to definite terminations through reduction-in-force proceedings when it was determined that the reduced production needs were of a permanent nature.

The Dismissal Fiasco

Responsible management required that the work force be reduced to the minimum necessary. This was not a pleasant task but the Bureau adopted what was felt to be the most equitable plan for effecting the separations in the light of the best interests of the Government. The production cutback in the Bureau affected the workload of other segments of the Department. They, too, had to institute reduction-in-force proceedings. Naturally, some employees affected by the separation actions believed they had been treated unfairly. Their dissatisfaction caused them to become tools in the hands of certain individuals who charged that the Government had been defrauded of

"probably hundreds of millions of dollars" through the issuance of "duplicate [Liberty Loan] bonds." Bitterness, in this instance, colored the complainants' judgment. Convinced that there were over-issues in the number of bonds printed and that numerical duplications were purposely initiated, the smitten employees willingly reduced their convictions to writing. There were others also, still employed in the Bureau, who provided additional spark to the already sizzling fuse of the powder keg. To merely say "print and issue" sounds like a simple operation, but when the printed matter involves Government securities there suddenly comes into being a complex network of rigid controls, special processes, and strict security measures. Unless one is fully informed, there can readily be a misconception of what any one phase may appear to represent.

The claims of fraud and the action taken as a result of these claims were to become the subject of acrimonious debate in the House and Senate. Before the matter was to be resolved, 29 persons would be summarily dismissed from their positions in the Bureau by one President of the United States and eventually be exonerated by another. There would be four different Directors of the Bureau in a span of less than 3 years. Two of the changes would be directly attributable to the charges and countercharges; and the other two appointments would be made in an effort to place Bureau operations on an even keel once again. The case would shake the Bureau to its very foundation and remain a vivid memory to Bureau employees for many years to come.

The charges originated in September

1920 with a former Assistant Register of the Treasury, who it was claimed had been discharged because he persistently brought the matter of duplicate bonds to the attention of his superiors. Treasury records show that charges of unfitness for duty had been brought against that official in 1919 and substantiated, and that President Wilson authorized his removal. However, in consideration of the officer's family he was permitted to resign in July 1920. Apparently piqued at the treatment he received, he published his charges. Later he took the information to his Congressman who turned the data over to the Department of Justice. That agency immediately initiated an investigation of the matter that was to drag on for almost 4 years. Concurrently, the Committee on Banking and Currency of the House of Representatives began an investigation of other allegations of mismanagement and misconduct in the Bureau. Thus was set in motion a series of chain reactions that were to develop into a cause celebre.

The high point of the case insofar as the Bureau was concerned was reached on March 31, 1922. On that date, President Warren G. Harding issued an Executive order summarily removing the Director, James L. Wilmeth, and the Assistant Director, James M. Fisher, from office and appointing two subofficials in the Bureau to those positions. The order also summarily dismissed 27 other persons assigned to top management positions in the Bureau and abolished 7 of those jobs. The order further provided that any of the 27 persons eligible for retirement on account of age should "be placed on the retired list" rather than be dismissed. No

reason was given for the discharges other than they were ordered "for the good of the service." Many of the persons concerned knew nothing of the action until the next day when they reported for work. Only those who had personal property on the premises were granted admittance to the building. They were permitted to retrieve their property under escort of a guard and then were immediately accompanied to the exits. A state of shock took hold of the Bureau. Since no specific charge was made against the dismissed employees, they were at a loss to defend themselves. Conjecture became rampant. Who might be next? What protection did one have for job security—if it could happen to one, it could happen to another. Wherein lay the opportunity to refute malicious gossip?

Records are not clear as to whether the Presidential order was prompted by the findings of the Department of Justice or those of the congressional committee. Nevertheless, they do show that nearly a year later President Harding became convinced that he had been misled and that an injustice had been done. By an Executive order of February 14, 1923, he restored the civil service status of 17 of the persons concerned.⁵ However, this

⁵ Six employees had elected to take advantage of the proviso of the original order permitting them to retire on account of age; three had already regained their status through employment by other Government agencies; and one had died. Apparently, there was still some doubt as to the innocence of the remaining two for they were not mentioned by the President's order. However, they were later restored to status on Dec. 24, 1923, by President Calvin Coolidge; one subsequently chose to return to the Bureau.

restoration did not bring immediate reinstatement. President Harding died in August 1923. During the next 6 months, it was conclusively proved that, although there were some numerical duplications of bonds issued, they were the result of the mechanical malfunction of the printing equipment and the ever-present element of human error and were in no way connected with the integrity and trustworthiness of the employees who had been summarily dismissed.

This turn of events brought about the resignation of the Director appointed to succeed Wilmeth. Upon the latter's refusal to accept reappointment, Maj. Wallace W. Kirby, Corps of Engineers, U.S. Army, was detailed by President Coolidge to serve as Acting Director of the Bureau on February 14, 1924. Major Kirby was a lithographer who was familiar with Bureau operations, having served for a year as Superintendent of the Bureau's offset platemaking division until his resignation in 1920. He described his taking over the directorship as follows:

At the time the present incumbent assumed control of the bureau (February 15, 1924), it was found that one of the first things to be done was to devise ways and means to gain the confidence of the employees and build up morale. The first step in that direction was the restoration to service of 17 of the officials dismissed by Executive order March 31, 1922. By way of explanation of the failure to reinstate all of the employees dismissed March 31, 1922, it may be stated that all who were eligible for reinstatement and in the United States were invited to confer with the director. Fourteen accepted reinstatement immediately,

three at a later date, some had reached the age of retirement, and others had died.

The spirit in which the original group were welcomed upon their return was the subject of an item which appeared in the *Washington Star* of March 2, 1924, reporting that crowds of coworkers gathered to congratulate the returned employees and that the strains of "Hail, Hail, the Gang's All Here" were heard echoing and reechoing throughout the halls. There were others who returned later amid less ceremony but it was, indeed, good to have them back. That's how it ended, the embarrassing fiasco that should never have happened. The dark cloud was removed, but many years later it was still talked about as though it had happened just the day before.

Major Kirby's original assignment was to cover a 30-day period. Later the Senate Military Affairs Committee recommended that he serve for an extended time. On this recommendation a Senate joint resolution was passed which authorized the President to appoint him as Director for a period of 6 months beginning June 16, 1924. While in this position he was permitted to retain his commission and was paid at the rank of major. He returned to duty with the Army on December 16, 1924.

Power Presses Vindicated

The unprecedented demands upon the Bureau for all types of securities during World War I served as the wedge that eventually opened the way to the unrestricted use of the power plate printing press.

Prior to October 1917 the only U.S. securities that could be legally printed on power presses were postage and internal revenue stamps and the backs and tints of currency and bonds. The initial weeks of hostilities saw production orders on the Bureau soar, particularly those for bonds. It was realized that the financing of the war effort would be seriously hampered if any phase of the bond program should fail. Practically from receipt of the first orders, the tints for Liberty Loan bond issues were printed by the offset method. This released printers for resassignment to other engraved plate jobs, but the relief thus attained proved only temporary. It was soon evident that more drastic action was required. Accordingly, the printing of the faces of the bonds was converted to power equipment. In September of that year, the Director of the Bureau volunteered the following explanation of this step during the Senate hearings on the urgent deficiency bill for fiscal year 1918.

In the printing of the bonds I say to you we printed them on power presses by and with the consent of the plate printers. That is a technical violation of the law, but we could not have executed them otherwise.

He then went on to ask that the legal prohibition against the full use of power presses be suspended during the continuance of the war. The requested relief was granted by an act of October 6, 1917 (40 Stat. 349), and extended to cover the period of "the emergency growing out of the war" by a subsequent act of July 11, 1919 (41 Stat. 44).

As previously mentioned, the use of power presses in the Bureau had ceased

as of July 1, 1889. Prior to that time and during the ensuing years the plate printers conducted a vigorous and vigilant anti-power-press campaign which wavered only during the war and postwar emergency periods.

The first breakthrough for the return of power presses into the Bureau came with the printing of postage stamps in 1894. Ten machines were purchased outright for the purpose and three more presses were added before the year was out. No objection was raised on the part of the plate printers to the introduction of this equipment, the theory being that previous to the time of the takeover of the production of postage stamps by the Bureau that work had been produced for the Government by the American Bank Note Co. on power presses. Since no disclamation of that practice had been made by organized labor, the Bureau printers could not well advocate a return to the slower and more expensive manner of printing the stamps on hand roller presses.

Encouraged by the satisfactory results obtained through the use of the machines in the printing of postage stamps, the Secretary of the Treasury approved the construction of 12 additional power presses which were installed in March 1898. It was intended that this new equipment would be employed for printing the backs of U.S. and Treasury notes and silver certificates. Their use for this purpose, however, was short lived. The sundry civil act for fiscal year 1899 (30 Stat. 604) contained the terse proviso, "That hereafter all bonds, notes, and checks shall be printed from hand-roller presses."

The restriction on power presses was

tightened further by the next year's appropriation bill (30 Stat. 1082) which specified "That the faces of all tobacco stamps for use upon packages of two pounds and upward, and of all beer, whiskey, cigar, snuff, oleomargarine, and special liquor tax stamps, shall hereafter be printed from engraved plates upon hand-roller plate-printing presses."

Efforts to expand use of the laborsaving presses were to remain stymied for the next 8 years. In a letter of March 27, 1913, to the Assistant Secretary of the Treasury, the Director described how partial relief in this regard was eventually achieved.

The Sundry Civil bill for the fiscal year ending June 30, 1908 [34 Stat. 1309], contained a joker which repealed the Act approved March 3, 1899 [regarding the manner of printing specified internal revenue stamps]. This joker was placed in the bill by the Committee on Appropriations of the House and did not become known to the parties interested in its suppression, and, in fact, was not known to anyone outside the interested Members of the Committee on Appropriations, until after the bill had been signed by the President. The joker was so worded as to cover up its purpose and read, as follows: "And the second proviso under this head in the Sundry Civil appropriation Act, approved March 3, 1899, is hereby repealed, . . ."

Soon thereafter the Bureau had 25 power presses engaged in the production of internal revenue stamps.

Another loosening of the restrictions was secured through a proviso of an appropriation act of August 24, 1912 (37 Stat. 430), which repealed in part the 1898 requirement that all bonds, notes, and checks be produced on hand presses. Effective as of the 1912 date it was per-

missible to print the backs of currency notes and bonds on power presses and the tints and checks by any process.

The Director, in his aforementioned letter, attributed the change to the hearings held by the Senate Committee on Printing on a bill to amend, revise, and codify the laws relating to the public printing and binding and the distribution of Government publications. He stated that these hearings “. . . culminated in a compromise agreement on the part of the Plate Printers Union and the Committee providing for the repeal of the said Act [of 1898].”

The quality of the products printed by the Bureau during the war period removed once and for all the stigma attached to power press work. The theory that such printings were inferior to those produced on hand roller presses was proven invalid. Finally, in 1923, the restriction on power presses was lifted permanently. An act of January 3 of that year (42 Stat. 1099) directed in part:

Hereafter the Secretary of the Treasury is authorized to print from plates of more than four subjects each upon power presses the fronts and backs of any paper money, bonds, or other printed matter now or hereafter authorized to be executed at the Bureau of Engraving and Printing;

This brought to a close the struggle of some 30 years' duration to introduce laborsaving equipment on an unrestricted basis in the printing of U.S. currency.

Electrolytic Plates

The dawn of the 20th century found little, if any, improvement in Jacob Perkins' transfer press. The siderography process was still the slow, tedious proce-

dure that he had developed back in the early 1800's. The growing influx of printing orders as World War I progressed sorely taxed the facilities of the Engraving Division. Even though that component operated three shifts daily, it was unable to keep pace with the requirements of the plate printing sections. The situation gave credence to the old adage that “necessity is the mother of invention.” George U. Rose, then Superintendent of the Engraving Division, developed an alternate method to the transfer process as a means of augmenting the supply of plates. Rose's plan called for the reproduction of printing plates by means of electrodeposition. In brief, his method employed the use of a steel engraved master plate upon which alternate layers of nickel and copper were deposited by the process of electrolysis to form an exact replica in reverse of the steel master. This reverse formation, called an *alto*, was then used to create *basso* reproductions, or press plates, by the same means.

By July 1918, the results of tests made of the proposed idea warranted the Bureau's requesting an evaluation of the method by the National Bureau of Standards, which after further experimentation on its part concluded “that the procedure devised by Mr. Rose was commercially practicable.” An electrolytic plant was established in the Bureau with the assistance of the Bureau of Standards in April 1920.

As is the case of any development in conflict with established interests, the project met with strong resistance. Shortly after creation of the unit there was a change in the directorship of the Bureau of Engraving and Printing and

the new incumbent, being unsympathetic to the method, restricted the operations of the plant to a negligible output. In 1923, on the basis of a reduction in the need for new plates, the Assistant Secretary of the Treasury authorized the abandonment of the operation. Fortunately, that official was "not satisfied that the electrolytic process . . . had a fair test" and directed that the equipment be retained and properly protected, "with the full intention of again putting the process into operation if and when occasion should arise." It was but a year later with another change in the directorship that the reopening of the unit was deemed feasible; the new incumbent reported that the "discontinuance of the electrolytic section about a year and half ago was found to be ill advised."

The saga of the firm establishment of the electrolytic process as an integral part of the Bureau operations is one of unyielding determination to succeed. The champions of the process, confident of its value, worked hard and persistently to demonstrate its practicability.

A valid argument of the opponents to the electrolytic process was that the serviceability of plates produced even with the hardest of nickel was not equal to that of casehardened steel plates produced by the transfer process. However, soon after the resumption of the activity, through further experimentation, it was determined that this difficulty could be overcome by coating the plates with chromium, the hardest metal known. An additional benefit was realized through the adoption of this coating feature in that a program was established whereby the plates were taken out of production prior to their becoming worn, the old

coating was then removed, and the plates were rechromed. This materially increased their use span and proved so effective that the principle was eventually applied to plates manufactured by the transfer process as well.

In 1928, a further improvement was effected. The use of copper in the production of the plates was discontinued. Instead, the bassos were made entirely of nickel and were approximately only one-half their former thickness. The nickel formations were then welded to thin sheets of iron to form press plates. Since iron was cheaper than copper, the innovation resulted in a substantial reduction in cost. A few years later another change was introduced in that a plastic cement was used as the adhesive for binding the electrolytic shell to the iron backing. This feature improved the strength and wearing qualities of the plates.

These and other modifications introduced into the system resulted in a vast improvement of the process over the years. For instance, during the first 3 years of operation the greatest number of impressions printed from an electrolytic plate was 48,000. In 1930 the average number was approximately 100,000 impressions per plate. Today, almost 98 percent of our paper money is printed from electrolytic plates having an average life of a half million impressions.

The existence of a plant capable of producing electrolytic plates facilitated the conversion to the dry printing of currency undertaken in 1957, for it would have been highly impracticable to produce a 32-subject plate by the transfer process. These larger plates are comprised entirely of nickel with a chromed coating.

CHAPTER VI A Smaller

Product—the depression and national recovery

1929–1940

THE INTRODUCTION OF smaller sized currency notes in 1929 was the culmination of 20 years' effort to achieve that goal. Franklin MacVeagh, who served as Secretary of the Treasury under President Taft from 1909 to 1913, can be credited with fathering the idea. His term of office is marked by his unflagging interest in the project. Soon after assuming office, Secretary MacVeagh appointed a committee made up of the Treasurer of the United States, the Chief of the Secret Service, the Chief of the Division of Loans and Currency, and the Director of the Bureau of Engraving and Printing to consider changing the designs and size of currency notes. After a very careful and exhaustive study, this group reported favorably on the advantages and savings which would result from an issue of smaller notes identical in size to Philippine currency which had proven "an unqualified success." The committee estimated that the savings to be realized through the proposal would amount to over \$600,000 annually. On the basis of the committee's findings, Secretary MacVeagh issued instructions to the Bureau on February 26, 1913, which stated in part:

I have caused this design to be prepared for use in connection with a change in the size of United States notes, gold and silver certificates and national-bank

notes from their present dimensions to the dimensions of Philippine certificates, and as soon as the engraving of the die of the new design is completed you will at once

prepare plates for the printing of the classes above named of this reduced size.

An interesting facet of the MacVeagh plan was his idea for a uniform back design for all denominations of currency. In the same letter of instructions, he directed:

Confirming my oral approval and instructions of January 31, 1913, the design prepared by Mr. Kenyon Cox, of New York City, for use on the backs of all denominations of paper money is hereby approved, and you are instructed to proceed immediately with the engraving of a die of this design, completing the work at the earliest moment possible.

Secretary MacVeagh's order was never executed. With the change of presidential administrations 1 week later, he was replaced as Secretary. The successor to the office, William G. McAdoo, while favorable to the project in general, instructed that the matter be held in abeyance until he had the opportunity to review it in detail. The setting up of the Federal Reserve banking system was then close at hand and was to absorb the attention of the Department for some time. Unwittingly, the idea of a change in currency design was to be sidetracked indefinitely.

In 1914 and again in 1918, attempts were made to revive the issue. However, the outbreak of war and the accompanying gigantic program of printing in the Bureau during the war years diverted attention from the plan to the more urgent issues of the times. The proposal was not completely forgotten, however. It was an often recurring topic of discussion among Department officials who were prodded by the magnitude of potential savings and the all but unanimous acceptance of the idea. There

were a multitude of problems to be resolved before a workable plan could be put into effect. Because a meeting of the minds could not be reached on all issues at the same time, the recommendations of later committees appointed to consider the matters were doomed to failure. There were differences of opinion in connection with the use of colors for printing the backs of notes; the use of a uniform design by type of note; the colors for the overprinting on the faces; the type of design to be used on the faces and backs; and the selection of portraits as well as the denominations on which they were to be used. In addition, there were many obstacles, which would have to be overcome, involving the issue and redemption of supplies of any new notes and, of course, printing processes and related machinery would have to be altered and new equipment acquired.

On August 20, 1925, Secretary of the Treasury Andrew W. Mellon appointed a committee to restudy the whole question of currency design, printing operations, issuance, and the related interests associated with replacing the large-sized currency with smaller notes. This group was to be the last of a long line appointed to investigate the pros and cons of the subject. Its deliberations were to be crowned with eventual success. The committee consisted of 15 officials representative of every phase of the U.S. monetary system and, in addition, included officials of the National Bureau of Standards and the Bureau of Efficiency.

The central group was broken down into eight subcommittees in order that detailed consideration could be given to the following prime facets embodied in an

undertaking of such magnitude as a change in our Nation's currency:

1. New designs
2. Mechanical production aspects
3. Inauguration of new designs
4. Distinctive paper
5. Reduction of note size
6. Currency contract clauses and legends
7. Destruction of unfit currency
8. Legal aspects

Once the study was begun it was discovered that the work of subcommittees Nos. 1 and 4 was so interrelated that they were combined. An example of the thoroughness of the task forces is shown in the records of subcommittee No. 1 regarding its deliberations of portrait selections: Washington was suggested for the \$1 note because his portrait was familiar to everyone and bills of this denomination had the greatest circulation; Garfield's likeness was suggested for the \$2 note because of the sentiment attached to our martyred Presidents and because his flowing beard would offer a marked contrast to the clean-shaven features of Washington and permit a ready distinction between the \$1 and \$2 bills; Lincoln for the \$5's because he followed Washington in the rank of American heroes and it seemed logical that Abe's likeness should appear on the denomination having the second largest circulation. And so the groups labored to bring about a plan that would save the Government millions of dollars annually.

Finally, in May 1927, nearly 18 years after the idea was conceived, Secretary Mellon approved the designs and recommendations of his appointed committee and, with the assurance that the Bureau

could handle the tremendous program, directed that the necessary steps be taken to effect the change from large- to small-sized notes. Dies, rolls, and plates for the new designs had to be made. The smaller size allowed the use of 12 subjects on each plate instead of 8 as previously used in printing most of the large notes. There was no difficulty experienced in converting the plate printing equipment, but the trimming machines, which removed the excess margins of the sheets, had to be rebuilt. Machines utilizing a new principle of numbering notes had to be designed and installed. It was necessary to accumulate stockpiles of sufficient quantities of notes to provide for the simultaneous issuance of the various classes and denominations. Notes of \$1 to \$20 were printed first; the higher denominations of gold certificates and Federal Reserve currency were to follow as soon as possible, as were the established denominations of national bank currency.

A scheme of numbering so valuable a product as paper money requires that there be no two notes of any one class, denomination, and series with the same identification number in order that the record of its production may be traced at any time. The system must be adequate to accommodate a large volume of notes and the size of type of the numbers used must be sufficiently large to facilitate immediate identification. This was the problem facing the Bureau in its task of numbering the new notes. The machines devised for the purpose were the product of the mechanical ingenuity of Bureau personnel. The simple explanation that the machines were constructed to separate the 12-subject sheets in half lengthwise,



In the summer of 1929 the Bureau and small-sized currency were prominent topics on the front pages and in editorial columns of newspapers throughout the country. This cartoon appeared in the Brooklyn (N.Y.) Eagle.

overprint the seals and numbers, cut the half sheets into individual notes, and dispense the notes in reverse numerical order, is in no manner indicative of the effort, labor, and heartache that went into the development of these presses.

Prior to the introduction of the new currency, a vigorous advertising campaign was conducted to fully inform the public of the description of the notes to be issued. Displays were exhibited in banks across the nation. Speakers went before large assemblies to describe the procedure by which the change in currency was to be accomplished and to outline the difficulties which were antici-

pated with the use of two sizes of notes during the interim period.

The results of 20 years of research, experimentation, and planning finally became a reality. The new notes were of such form that not only were they attractive in appearance but they also embodied security features which readily identified the "real McCoy" from spurious issues. The uniformity of portraits for the same denomination was an identifying feature which put a cramp in the counterfeiters' style of upping a value. This mode of altering notes had been successful because of the widespread confusion as to what designs belonged to which denominations.

For instance, as late as 1922 the Bureau delivered 6 classes of currency notes encompassing 15 different series in all with varying face and back designs for 11 denominations, many of which were repeated among the various classes. With the adoption of the uniform portrait system the general public was alerted to associate the value of a note with the related portrait. The classes of currency were distinguished by the color of ink used to overprint the Treasury seal and the note serial numbers; silver certificates were overprinted in blue, U.S. notes in red, gold certificates in yellow, Federal Reserve notes in green, and national bank notes in brown.

One distinctive item, which was developed quite by accident during the research program to acquire a paper with unique characteristics and of a superior quality, was the new distributed fiber paper used for the small notes. The find was the result of work spoiled at the mill, which had been put back into the beaters and reprocessed. The silk fibers that had formerly appeared in localized strips were distributed throughout the product in the form of small particles. Careful study of this distributed silk fiber led to the conclusion that it furnished a distinctive marking difficult to counterfeit.

The End of an Era

The conversion from four- to eight-subject currency plates which occurred in 1918 did not embody national bank currency. At that time there were some 7,700 national banks. Each had the authority to issue notes of a common basic design bearing its own name. This entailed the

use and maintenance of distinctive plate stocks for notes of a particular bank. Few banks had need for printed stocks of any one denomination in quantities that would warrant the use of the larger sized plates. In fact, production needs were such that it was not unusual to print mixed denominations of notes for a particular bank from the same four-subject plate or, in the case of \$50 and \$100 notes, to print only one each from a two-subject plate.

The introduction of small-sized currency in 1929 brought about the most radical change in the production of national currency since its inception in 1863. Along with all other classes of currency, its production was converted to 12-subject plates. The notes were incorporated into the denominational-portrait and uniform back design systems which were the significant innovations accompanying the change in the size of U.S. paper money. The names of the banks were no longer engraved in the printing plates but were overprinted typographically on the notes. Also, the facsimile signatures of the banks' officers were overprinted by the Bureau. Previously the notes had been delivered in uncut sheets and the necessary signatures were either signed manually or the bank arranged to have them overprinted by local jobbers.

These changes were a boon to the Bureau in light of the fact that as of January 1, 1929, there were still more than 7,600 national banks in existence. Under the old method of production it was necessary to await receipt of a specific order and then to withdraw the plates of the ordering bank and go to

press. No advance work was practical. Under the new system of printing, sheets of a particular denomination could be printed in anticipation of future requirements and the stocks placed in storage. When an order was received, the number of sheets required could be withdrawn and the name of the bank and the signatures overprinted without delay. The plan accomplished a threefold purpose: it materially reduced the length of time required to complete an order; the amount and the variety of engraved plate stock were materially reduced with the attendant benefits of a savings in steel, storage facilities, and less account keeping; and, since all currency sheets were then of a uniform size, processing equipment could be standardized.

Thus it was possible to abandon the use of the single-plate handpress. This type press had been used since the very beginning of currency printing operations in the Treasury Department. Now the once mighty monarch was dethroned. It had seen the rise and fall of the hydrostatic press and the steam press, and its exponents had fought a tenacious battle of some 30 years' duration against its replacement by the four-plate power press. Upon completion of the final order for the old-size national bank notes on August 7, 1929, the section in which these notes were printed was closed. The 50 presses in this room, the last of a group which in their heyday had numbered as high as 585, were dismantled and sold for scrap.

Today, there remain in the Bureau only a token number of these presses. They are reserved for the proving of plates and the production of small special orders.

Extensive Furlough Plan

The matter of adjusting personnel quotas to fluctuating program needs had long been a problem in the administration of Bureau affairs. As early as 1864, Spencer Clark had expressed concern regarding the subject. The problem was particularly acute during the transition period from old- to new-size currency. The solution lay in the inauguration of a rotating furlough system. It was adopted to avoid dismissal of experienced employees temporarily in excess, but whose services would be needed in later phases when production was in full swing. Through this plan employees in overstaffed units would be off from work a fixed number of days each month without pay. The idea was not new to the Bureau's operations. It had been used on numerous occasions in the past.

The printing of the initial supply of the smaller currency was completed on June 30, 1929. A sharp decline in the work program which immediately followed the issuance of the new notes necessitated not only the release of the temporary help engaged in accomplishing the unprecedented production of the first half of 1929 but also an adjustment of the permanent force of employees. Furloughs were again resorted to after careful consideration of the interests of both the employees and the Government.

Close upon the heels of the issuance of the first small notes in July 1929 came the collapse of the New York stock market to be followed by the staggering depression of the early 1930's. The Nation's financial condition had its effect on the demand for currency notes and

other securities. Little did the Bureau's management dream that upon the inauguration of a furlough plan late in 1929, the system would extend over a period of 6 years with only intermittent periods of relief. It principally affected plate printers, plate finishers, and women operatives, and at times applied to all classes of employees. Furlough schedules were worked out for employees in every production division, the number of days off depending on the workload in each component. Any reduction in personnel was accomplished only by voluntary resignations and retirements.

The Bureau's annual reports for the fiscal years 1930 through 1936 are replete in their descriptions of the fluctuations that occurred in the program and of the efforts taken to alleviate the situation. Every operating division was placed on a rotating furlough basis throughout most of fiscal year 1930. During the greater part of 1931 and 1932, the plan applied only to three groups in which there were surplus employees. Plate printers were required to be off 3 days a month; plate finishers, 1 day a month; and women operatives, from 1 to 4 days a month. In fiscal year 1933 there was an alleviation of the situation brought about by the need for "emergency currency" during the months of March and April. It was in fiscal year 1934 that the furlough system had its full impact. During the months of August through October 1933, every employee observed some offdays and plate printers were out of work for as many as 11 days each month. Thereafter the situation gradually tapered and by the last quarter of fiscal year 1936 full pro-

duction operations were once again resumed. Through humane considerations and mutual cooperation on the part of both management and labor, the Bureau had weathered the storm well.

"Emergency Currency"

The Bureau was concerned in a number of programs instituted by the Government to stem the tide of the depression because of the demands for its printing services in connection with the recovery projects. Many of the requests made upon the Bureau necessitated quick and decisive action. A case in point was the special currency authorized by emergency legislation of March 9, 1933, for an issue of Federal Reserve Bank notes. The urgency for this issuance of additional notes was due to the panic withdrawals of savings deposited in the banks throughout the Nation. Foresight and versatility were essential if the dire consequences that could have resulted from the ensuing paper money shortage were to be avoided.

It would have taken 18 months to prepare the new currency issue had conventional methods been followed. However, only 2 days after passage of the legislation, the first shipment of the new notes was on its way to the Federal Reserve Bank of New York. The dispatch of currency to the other Federal Reserve banks followed immediately. Such an accomplishment was the result of ingenuity on the Bureau's part. Much of the preliminary work relating to the new notes was accomplished at the same time that the financial aspects were being considered and the legislative bill was being

drafted. The expeditious production of the currency was made possible through improvising available blank engraved stocks of national bank currency for the purpose. This was achieved by blocking out the officers' engraved titles already appearing on the notes and overprinting the names of the Federal Reserve banks and the facsimile signatures and the substitute titles of the required officials by means of logotypes.

An example of the speed with which the project was handled is found in the preparation of notes for the Federal Reserve Bank of San Francisco. It was necessary to procure actual signatures of two officials of every Federal Reserve bank for use in preparing the overprinting plates. Telegrams were dispatched to the banks asking that the necessary specimens be furnished immediately. In order to brook no delay in getting initial stocks of the new notes to the west coast, signatures of the Californians were copied from documents on file in the Treasury. Any necessary corrections could be made later. Notes bearing the San Francisco officers' facsimile signatures were already en route when the specimens requested by telegram were received at the Bureau from that bank.

The dire need for "emergency currency" soon subsided; however, shipments of token amounts continued to be made through February 1934. The face value of the total deliveries was in excess of \$460 million. The Bureau could take pride in the part it played in boosting public confidence in the Nation's banks, for during the emergency period it also handled the rush order received for more than

5 million sheets of regular Federal Reserve notes. Recognition of its effort was given in a departmental news release issued in March 1933 which stated, in part:

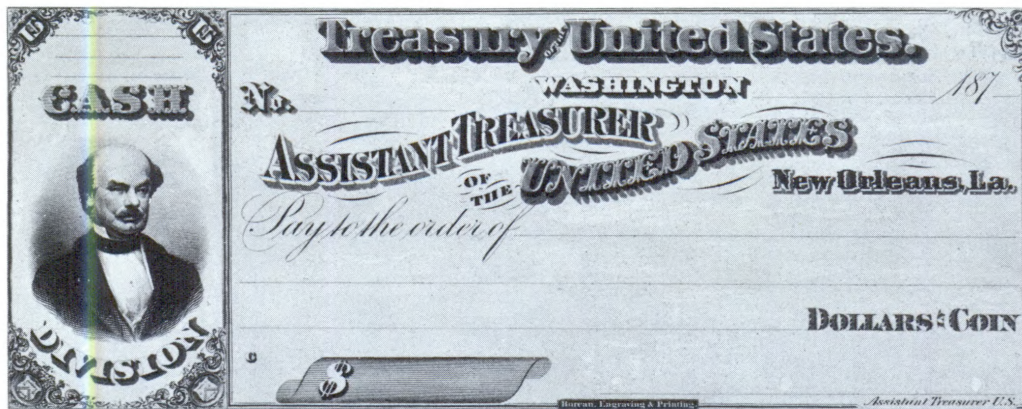
The production required by the Emergency Bank Act is unprecedented. To meet this program many quick changes had to be made in the methods of handling the currency as it passed from one operation to another. Vaults had to be expanded. The entire staff of the Bureau undertook the task in splendid spirit.

"Emergency currency" was also to serve in another critical situation 10 years later. After the last delivery was made in 1934 there remained on hand 7,317 packages comprising some 29 million of these notes in the vaults of the Bureau. During World War II these stocks were used to help meet the large demands made for currency.

A Big Check Job

A great volume of the work performed by the Bureau during the depression and recovery periods was the printing of checks ordered by the various Federal agencies concerned with the gigantic task of improving the unstable economic and employment conditions of the times.

Checks had been produced by the Bureau for the various Government departments as far back as the mid-1860's. These early items were cumbersome things in comparison with the small-sized, coded checks that serve the ordinary citizen's banking needs today. Nevertheless, they were beautiful examples of the art of engraving that was then in its prime. With the constant call for increased requirements, the mode of printing Govern-



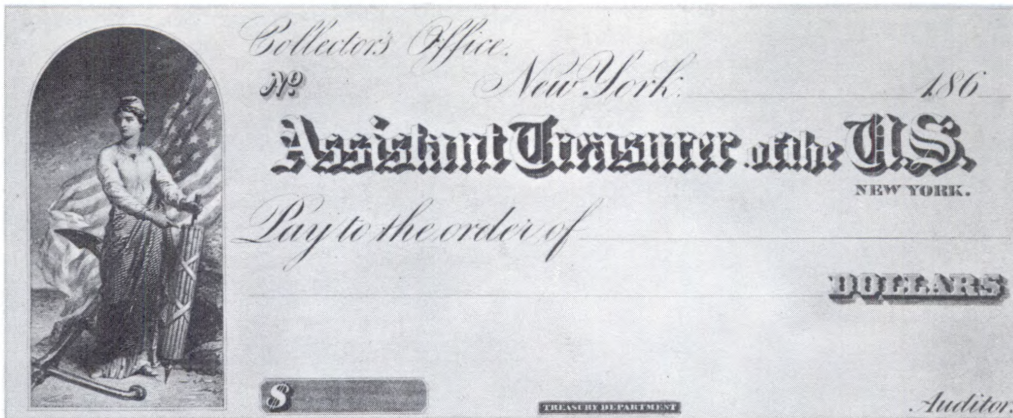
Check used in the 1870's for drawing on the account of the Assistant Treasurer of the United States at New Orleans, specifying payment in a dollar amount but with coin. It carries the portrait of Francis E. Spinner, Treasurer of the United States from 1861 to 1875. Apparently, the law prohibiting use of the likeness of a living person on a security was construed as not applicable to checks, for Spinner lived until 1890.

ment checks was gradually changed. The introduction of the once-so-familiar check paper with its overall green security tint design obviated the needed for the security factor provided by the engraved process and production of checks was converted to the offset method of printing. The handling of orders for checks came to be regarded as a mere routine job.

On November 9, 1933, President Franklin D. Roosevelt created by Executive order the Federal Civil Works Administration to provide regular employment on public works projects for some 4 million jobless men and women. Soon thereafter the Bureau had cause to change its mind as to the mere routine of a check-printing job. The new public works agency placed an order for every U.S. disbursing officer throughout the Nation to be furnished a supply of its checks. Here was a job that taxed the resources of the Bureau to the very limit. Barely

a week's notice was given for the manufacture and distribution of an initial supply of the checks. Fifty temporary employees were immediately hired to assist in the task and three 8-hour shifts were organized for 'round-the-clock production. Deliveries had to be made by air shipment in many instances in order that supplies might be available to meet beginning payroll time requirements. Approximately 4 million of these checks were delivered each week until the spring of 1934 when the orders were discontinued.

The Bureau was to continue the production of Government checks on a voluminous scale for some 20 years after the precedent-setting Civil Works Administration job. However, 1943 saw the beginning of the decline in the demands upon the Bureau for this class of work. In that year the Treasury decided that it would be economical to have a portion of the checks, particularly in the case of



A Government check produced during the early days of printing at the Treasury Department. It was printed in a currency-green color. The allegorical figure represents "Liberty and Union." The original die for the vignette was prepared by the American Bank Note Co.

large users, produced in punchcard format. Such a change would greatly facilitate the financial accounting of redeemed checks by mechanical processing. Responsibility of arranging for the production of the card checks through commercial contracts was assigned to the Bureau. Gradually throughout the years that followed, more and more checks were printed in card form. Finally, in 1956 with the establishment of an integrated electronic system for the payment and reconciliation of checks drawn on the Treasurer of the United States, the need for paper checks dwindled to a mere trickle. A once voluminous work project was concluded. However, the Bureau continued to handle the orders for card checks through June 1960, when the contractual duties were assumed directly by the Treasurer's office. Today, only small token lots of paper checks required for special purposes are printed in the Bureau.

"Baby Bonds" and Other Securities

Financing operations of the Treasury and the activities of newly created Federal agencies during the national recovery period required the preparation of many new bonds and other types of securities. Orders for nearly all the items were rush jobs which entailed the preparation of new designs and models and the manufacture of dies and plates before the printing could begin. Production of these items helped make possible the total elimination of the rotating furlough plan on March 1, 1935. The introduction of U.S. savings bonds early in that year was a significant factor in the discontinuance of the temporary layoffs.

These bonds were unusual in a sense in that they were intended primarily to furnish a type of Government security which would be attractive to the small investor. They were particularly in-

tended to appeal to the ordinary citizen who desired to lay aside funds for future use and yet who could devote only small amounts at any one time for the purpose. Although these bonds were issued in values as high as \$500 and \$1,000, the bulk consisted of \$25, \$50, and \$100 denominations, from which they derived their popular title of "baby bonds." Each value bore the portrait of a President. Woodrow Wilson's likeness was selected for the \$500 denomination. This was the first time that his portrait had been used on a public debt security of the United States. The bonds were sold on a discount basis of one-fourth less than their denominational value and matured fully in 10 years. In order to encourage their sales they were made available at all first-, second-, and third-class post offices, and at all fourth-class post offices located at county seats.

Within a month after receipt of the original order, the Bureau made the initial delivery of savings bonds. A Treasury Department promotional brochure relating to these securities described the sale of the first bond:

On the morning of March 1, 1935, at the White House, before an audience of Government officials and newspaper men, President Franklin Delano Roosevelt, Henry Morgenthau, Jr., Secretary of the Treasury and James A. Farley, Postmaster General, enacted for the news cameras the purchase by the President of the first United States Savings Bond. This scene was shown in the motion picture houses throughout the country, received considerable comment from the press, and then, pretty generally, was forgotten. Nonetheless, this event is of historic interest and is destined to be of lasting significance to the American people.

President Roosevelt's purchase was to

be imitated millions of times over. Within less than 5 years more than 11 million of these bonds had been sold to some 2 million investors whose purchases represented \$3 billion in maturity value. The extent of the bonds' significance to the Nation, spoken of in the promotional release, could not even then be imagined. Little was it thought that savings bonds would eventually evolve into defense savings bonds and later change to war savings bonds. With the return to peace in 1945 the original title was resumed and savings bonds are still being sold today.

Other prominent security issues produced in the national recovery period included Home Owners' Loan Corporation bonds and Federal Farm Mortgage Corporation bonds. The initial printing orders for these items called for more than 10 million bonds. In order to meet the delivery schedules established by the issuing offices, it was necessary to assign as many as 75 percent of the plate printing presses to the production of these items.

Another major task for the Bureau during the recovery period was the printing in 1936 of registered adjusted service bonds, resulting from the passage of the Veterans' Bonus bill. The enabling legislation was enacted, over a Presidential veto, on January 27, 1936. It provided for issuance of the bonds by the following June 15. The time schedule set up for the issuance of the securities meant that the Bureau had to prepare steel plates, print and number the bonds, and perform many other operations incidental to the finished securities within a period of 3 months. The bonds were issued in only one denomination, \$50. The Bureau's deliveries of this item exceeded 37 million pieces, all within the time set. To meet

the deadline it was necessary to increase various operating forces, particularly that of the plate printers.

Because of the bonus bond job and other increases in the production program, 49 men who were employed in various capacities in the Bureau, but who were qualified plate printers, were transferred and given permanent appointment on the printing force. The Bureau's management was especially pleased in being able to take this action. Many of these men had been caught in the reductions in force that had occurred in the early 1920's. Rather than disassociate themselves entirely from the Bureau, they had elected to accept other assignments offered them and to wait out an opportunity to return to their regular trade. For some it had been a wait of more than 10 years.

New Currency Designs

In accordance with monetary legislation effective in 1933 and 1934, new series of silver certificates, gold certificates, and Federal Reserve notes were called for. This entailed new designs, all of which were designated as series 1934, for a total of 15 denominations in the 3 classes of bills.

The following year brought yet another change in the design of the \$1 silver certificate. Heretofore, it was customary to engrave the signatures of the certifying officers, the Secretary of the Treasury and the Treasurer of the United States, in the printing plates. But this procedure presented a problem. A change of either of these officers necessitated an alteration of the plates. Consequently, there was always a great deal of delay before all bills bearing the new signature combination

were in full production. This situation was particularly acute in regard to \$1 notes. The greatest volume of currency production comprises bills of that denomination and their plates make up the bulk of plate stock. Profiting from its experience with logotypes in producing national bank notes, the Bureau decided that it would be feasible to overprint the officials' signatures on the \$1 notes.¹ Thus, whenever a new Secretary or Treasurer was appointed, new bills bearing his signature could be available in a very short while and the changeover could be effected in a more economical manner.

Although there was no radical departure from the face design of the \$1 bills of the 1934 series, many of the individual features had to be rearranged to accommodate the new overprinting. Then too, in order to conform to the scheme of printing the serial numbers and seals in distinct colors for the respective classes of currency, the Bureau had to convert some of its numbering and sealing equipment from single to bicolor machines. The new notes, designated as series 1935, were numbered and sealed in the established blue color for silver certificates and the signatures were overprinted in black in a simultaneous operation.

It was the design selected for the back of the new notes that created the greatest interest, from the President down. Here were pictured for the first time on any money issued by our Government both the obverse and reverse of the Great Seal of the United States. The only previous use

¹ Overprinting the signatures on other denominations was to await changes in their designs made in 1950 and 1953.

REVISED MODEL



Model of the revised design of the \$1 back approved by President Roosevelt and Secretary of the Treasury Morgenthau.

reverse of the seal is also rich in symbolism. The pyramid is representative of permanence and strength. At its base in Roman numerals appears "1776," the year of the Declaration of Independence. The structure's unfinished condition denotes that there was still work to be done to form a more perfect government and signifies the expectation that new States would be admitted to the Union. The eye in the triangular glory represents an all-seeing Deity and with the motto "Annuat Coeptis" alludes to the many signal interpositions of Divine Providence in the forming of our Government. The

motto is translated, "He [God] has favored our undertakings." "Novus Ordo Seclorum" is translated as "A new order of the ages" and, in the words of the designers of the seal, signifies "the beginning of the New American Era."

Printing of Foreign Currencies

It has been customary over the years for the Treasury Department to cooperate with various foreign governments in the manufacture of their coins by the U.S.

Mint. However, this practice has not prevailed insofar as foreign paper money is concerned. No American commercial firms engage in the production of coins; on the other hand, printing of banknotes and similar securities on a commercial basis is a well-established private industry in the United States. Therefore, the Department's view is that to undertake the printing of foreign currencies would be to compete with private industry.

There has been one notable exception to this policy. In 1934 the Treasury Department, in the interest of diplomatic relations at that time, acceded to a request made by the Department of State that the Bureau print an issue of currency notes in the amount of 10 million pesos for the Republic of Cuba. The job entailed the preparation of dies and plates for five denominations and the printing and processing of more than 5½ million notes. The work was produced in 12-subject sheets and involved three separate engraved printings: a face tint, basic face design, and the back. The distinctive paper used for the purpose had the same physical qualities as the paper for U.S. money, except that the former contained only red distributed silk fibers, whereas both red and blue fibers were used for our Government's security paper.

When the work was undertaken by the Bureau it was stipulated that all engraved media used in the production of this order were to remain in the custody of the printer, namely the Bureau. This stipulation was an accepted banknote industry practice the world over. In view of this condition, it was agreed that the printing of additional quantities of these particular Cuban notes would be undertaken peri-

odically as needed. However, it was specified that the printing in this one instance was not to be regarded as a precedent case. The Bureau continued to receive and process orders for small quantities of the Cuban notes from time to time. The last delivery was made in 1950. In 1954, upon advice from the Cuban Government that no further orders were contemplated, the dies, rolls, plates, and seals used in the production of the currency were canceled and destroyed.

The Bureau was again involved in the production of foreign currencies on a limited scale in two other instances. In 1945 the Royal Siamese Government, through the U.S. Department of State, requested the Bureau's assistance in the preparation of a special temporary issue of its currency. Although the Bureau designed the notes, their actual production was performed by a Boston commercial printing establishment. The issue was made up of three sizes of currency and comprised five denominations in all. The work was produced by the offset-lithographic method, with two colors on the back and four on the face. The printed work was then transferred to the Bureau in sheet form where it was numbered, cut into individual notes, and boxed for shipment. The total volume handled under this project was 327 million notes.

In 1947, in accordance with plans made by the U.S. War, Treasury, and State Departments and the Government of South Korea, the Bureau handled the production of an issue of Korean currency. All orders for the notes were placed by the War Department. The job was handled in the same manner as was the Siamese currency. The lithographic process was



An early 1900 handfed, motor-driven, sheet perforating machine.

used and the printing was performed by a commercial plant under contract with the Bureau. The job, comprising a total of 208 million notes for three denominations, was completed in the record time of 4 months.

Development of Electric-Eye Perforating Equipment

In the fiscal year 1888, the Director reported the installation of 1,000 incandescent lamps for lighting the Bureau building. It was at about the same time that the famous German scientist, Heinrich Hertz, discovered that light under certain circumstances affected the intensity of electric current. These events, separated by thousands of miles, were to join in a significant relationship some 40 years later

when the Bureau developed electric-eye equipment suitable for the perforating of postage stamps.

The excessive amount of spoilage occurring during the perforating operation had plagued the Bureau from the very beginning of its taking over the production of postage stamps in 1894. The private banknote companies that produced the stamps prior to that time had experienced the same problem. The wetting and drying of the paper, essential to the plate printing method of production of stamps, as well as the gumming of the printed sheets, caused the work to expand and contract. These physical changes were not uniform throughout a sheet, and as a result it was difficult to perforate the stamps without punching into the printed areas. However, the stretch and shrinkage were usually consistent in a par-



Electric-eye perforating machine introduced in 1939.

ticular lot of work. So long as postage stamps were produced in single sheet form, the situation could be rectified to some extent by manually adjusting the perforating equipment to allow for the variances that occurred. On the other hand, in the printing of stamps in web form on the Stickney presses, the changing conditions were cumulative and it was not unusual that there would be a variance in size and stamp location between the first and last sheets from the same roll. There were other contributing factors to the variations that occurred in the work printed in rolls; such as, temperature, atmospheric conditions, and water absorption characteristics of the paper.

Studies conducted relative to the situation showed that the discrepancies of three thirty-seconds of an inch in the length of printed 400-subject sheets were not uncommon; the differences in width were sometimes found to be as much as a quarter of an inch. At first reading these variances might seem minute, but when it is remembered that the longitudinal difference expanded with the length of the roll, they become quite significant in view of the close tolerance between rows of stamps. Even with the services of the most skilled machine operatives, perforating spoilage was extremely high.

Experimentation with the perforating of printed rolls of postage stamps by means of electronic controls was begun by the Bureau in 1930. This resulted in the development of primary equipment which was designed and built for part-manual and part-electronic control. Further improvements were made and a pilot machine was constructed that reduced the need for manual corrections to a minimum. The first delivery comprising some 9 million stamps perforated on this machine was shipped on February 5, 1935. A production machine was developed by Bureau personnel as a result of extensive experimentation; it incorporated more advanced mechanical and electrical controls and was put into operation by 1939. Two years later five improved production models were purchased and installed. Further refinements in the equipment have been made over the years.

The principles employed in the operation of these machines are highly technical. The following description is a simplified explanation of the functions of this very complex equipment.

In total effect, the electronic controls make continuous adjustments to center the roll of printed stamps as it is fed into the machine, operate the vertical and horizontal perforating elements, and activate the sheet-cutting blades. The work in printed roll form has so-called electric-eye register markings printed in the side margins and through the space in the center of the sheet referred to as the gutter. The roll is placed in a carriage in the perforator and a beam of light is impinged onto the gutter markings. As the roll

unwinds, the register marks are scanned by a pair of phototubes. Any slight variation in the position of the markings will set up a corresponding lack of balance through the scanners and initiate the movement of the carriage in the direction required to maintain the proper centering of the moving web of paper. In this manner the web is delivered to a set of punch-and-die wheels that perforate the stamps lengthwise. The web next passes to the lateral, or horizontal, perforating element which comprises a group of cylinders equipped with punch-and-die bars extending across the web. Registration of these lateral perforations is controlled by a unit containing another light source and photoelectric cell, or scanning eye, located just in front of the horizontal perforators. This light is beamed at the dashes printed in the margin of the web of paper between the lateral rows of stamps. If for any reason, due to contraction or expansion of the paper, these series of markings fail to appear directly under the light beam, the electric circuit is closed. The closing of this circuit causes current to flow through a series of controls which move the horizontal bars either forward or backward into proper position. A cutoff knife, also synchronized with the lateral perforator, cuts the web into sheets of the appropriate size. The wonder of the machine is that all these adjustments are accomplished while the web of printed paper is moving at the rate of approximately 250 feet per minute.

The electronic equipment in use today provides for accuracy within limits of one-hundredth of an inch. The effectiveness of these machines is illustrated by the fact

that spoilage during the perforating operations on the old, sheet hand-fed perforators averaged 35 percent of the work processed. Today, that figure has been reduced to less than 2 percent.

The Annex Building

A step of major importance was the expansion of the Bureau's physical plant by the erection of the annex building which was officially occupied on May 17, 1938. As early as the mid-1920's the Bureau had urged that the Department give serious consideration to centralizing under one roof all those Bureau activities then housed in numerous outbuildings. Most of these additions were temporary structures and were in dilapidated condition. Many of them had been so constructed that it was impossible to install improvements that had been developed in the areas of fire and theft protection. The main Bureau building, which had been completed and occupied in 1914, was already overcrowded, and expansion of that structure to provide for the increased demands being made for the printing of U.S. securities was not practical. The Director in writing to the Assistant Secretary of the Treasury in 1926 relative to the situation stated:

The space now available for these activities [subsidiary security production functions] is inadequate and the buildings are in a very bad condition. Additions cannot be made and repairs would be exorbitant when the limited space is considered. . . . The gravity of the now existing undesirable, hazardous conditions increases each year.

In the early 1930's it was proposed that the Government acquire the square of land opposite the main building, bounded by 14th Street, C and D Streets, and Linworth Place as a site for an annex for the Bureau. The plans called for a rectangular-shaped building surrounding an open center court. Originally, it was intended that the building accommodate only activities directly connected with the Bureau. However, it was later proposed that Linworth Place be closed and the building be extended eastward to include the adjacent square in order to house other Treasury Department functions that were closely allied with the Bureau's production activities.

Finally in 1935, working in conjunction with the Commissioner of the Public Debt, who also was pressed for space to house many of his agency's activities, the Director of the Bureau was successful in persuading the Department to request a congressional appropriation for the erection of an annex building. On August 13, 1935, Congress appropriated an initial sum of \$2 million for the "site and construction of an additional building for the Bureau of Engraving and Printing and other Treasury Department activities, . . . within a total limit of cost not to exceed \$5,500,000" (49 Stat. 600).

No time was lost in getting the project underway. Within 2 weeks preliminary plans which had been prepared in the Bureau in anticipation of congressional approval for a new building were forwarded to the Treasury Department's Procurement Division, which was in charge of the construction work. These plans were based on an exhaustive survey made to determine general design fea-

tures, such as floorspace requirements; column spacing; type of ventilation; door sizes and types; elevator sizes, capacities, and locations; and vault and partition locations. This study also was extended to include the most economical and practical location of divisions, sections, and mechanical equipment. As a result, the plans were so complete as to permit the installation of conduits, waste lines, water pipes, and air and vacuum lines in the concrete floor fill for each machine and piece of equipment proposed to be located in the new building.

Preparation of drawings by the Procurement Division for the new building was completed in March 1936; demolition of buildings then located on the site was begun by the following June and the first concrete was poured a month later. The original estimates for the construction of the annex did not provide for sufficient funds. Therefore, in June 1936, Congress raised the total authorization to \$6,325,000 (49 Stat. 1640). The original plans provided for the building to be constructed of steel superstructure but, because of the shortage of funds, reinforced concrete was substituted. (At the time of construction it was believed that the annex building was the second largest reinforced-concrete structure in the world.) The original plans also called for the building to be faced with tapestry brick. However, in consideration of the fact that it would be so situated as to be one of the first Government buildings to be viewed by visitors entering Washington from the South, it was decided to use a limestone facing compatible with that of the main Bureau building.

The annex was constructed in the shape of a scaling ladder. The center portion extends from 13th to 14th Street, with five wings projecting from each side. It is seven stories high, exclusive of a sub-basement, basement, attic, and penthouse. The basement and the first and second floors cover the entire foundation area; the wings begin above the second story. The building was arranged to provide for the greatest amount of storage space possible, yet at the same time to allow abundant light in the wing areas where the work operations would be located.

Two tunnels were constructed beneath adjacent streets for the annex. One of the tunnels runs under 14th Street and connects the annex to the main building. The other burrows under D Street and provides direct railside connections by means of a spur track from the neighboring railroad yard. Raw materials for the Bureau can be unloaded directly from freight cars, loaded onto industrial trucks, and transported to storage or work areas. This eliminated the expensive trucking service required to transport freight from the railroad yards to the Bureau.

A unique use was made of this special siding and loading platform by the U.S. Secret Service in connection with its duties to protect the President. Because it was extremely difficult for President Franklin D. Roosevelt to climb stairs, when he was scheduled to travel by train the Presidential railroad car was shuttled onto the Bureau's siding and the President was driven by automobile into the Bureau and directly to the loading platform. Here he could board the private car without inconvenience in a well-protected area.

The building was completed on May 16, 1938, more than 2 months earlier than called for by the construction contract. The total cost expended for the structure, including the installation of elevators and the spur track and loading platform, was \$5,667,000.² A review of the quantities of materials used in the construction of the annex would be a special delight to the statistician—there were 17,600 windowpanes installed in the building requiring the use of 25,000 pounds of putty, 690 single and 230 double doors, and 1,300 radiators. There were approximately 10,000 lighting outlets and 126,000 feet of piping throughout the structure. More than 6,400 tons of reinforced steel and 1,300 tons of structural steel in addition to 140,000 tons of concrete were used in the construction. The building contains more than 600,000 square feet of workspace and the floors were built to carry a live load of 250 pounds per square foot. It houses 19 reinforced-concrete vaults.

The completion of the building culminated a 12-year effort to provide additional workspace for the Bureau's ever-expanding workload. It was indeed fortunate that an annex building has been erected, for with the outbreak of World War II the Bureau was swamped with production orders and management would have been hard pressed to find space to house all the mushrooming activities.

² In addition, \$298,000 was expended in the removal of an old electrical substation to make way for the tunnel under 14th Street and for the construction of a new powerplant facility erected between A and B wings of the main building.

Expanded Research and Development Program

From the earliest days of the Bureau special attention has been given to the development of improved materials and equipment used in the manufacture of its products. The banknote industry was a highly competitive business. There was little or no exchange of ideas between companies, much less with the Bureau. Advancements in processing systems and improvements to standard printing equipment were closely guarded company secrets. Thus the Bureau came to rely, to a great extent, on its own ingenuity, and its achievements are extensive. One improvement after another was adopted through the years—hydrostatic presses in 1864; sizing of securities in 1871; use of silk-fiber paper in 1879; the development of postage stamp gumming machines in 1894; the development of a combination sealing, numbering, and separating machine in 1909; and the reduction in the size of currency notes in 1929, to name but a few. Although a great deal of attention was devoted to improving materials used in the manufacture of the securities, greater emphasis was placed on the development of mechanical improvements.

It was in 1938 that a very significant step in the field of experimental research was undertaken by the Bureau. By the direction of the Secretary, the Office of Research and Development Engineering was created, primarily for the purpose of exploring deterrents to counterfeiting. The creation of the new Office was the culmination of efforts undertaken about

5 years previously with the establishing of a research and experimental laboratory on a small scale. The prime function of this laboratory was the study of possible ways and means to improve the physical qualities of U.S. securities in order to add to the difficulties of their being successfully counterfeited. The scope of work was necessarily limited because of the lack of suitable workspace. Upon approval of the erection of a Bureau annex, steps were immediately taken to purchase equipment and form the nucleus of a specialized staff necessary for expansion of the laboratory into a full-scale operation. This expansion allowed for the undertaking of extensive research and experimental work relating not only to improvement of the Bureau's products but also to development of equipment for improvement of its processes.

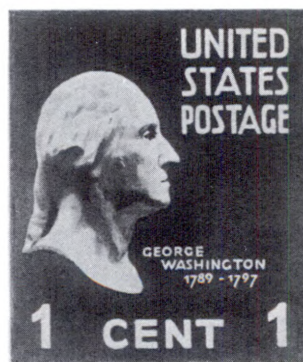
The magnitude of the achievements destined to come out of this new Office is well illustrated in a report of the projects underway just 3 years after its creation—the development of a postage stamp gum from domestic dextrine, conduct of infrared drying tests on inks, improvement and simplification of ink formulas, study of high-melting paraffin waxes for possible use in interleaving books of stamps, development of techniques for the analysis of counterfeit notes, investigation of water- and grease-resistant coatings for securities, study of pressure-sensitive adhesives, use of disposable containers for printing inks, and the reclamation of waste printing inks.

The improvements sought in creating this new research component can be summed up briefly. They entailed increased deterrents against counterfeiting

of securities, longer life of currency notes, greater flexibility and uniformity in production conditions, and reduced manufacturing costs. And these remain the criteria today, the day of nonoffset ink, currency produced by the dry-printed method, and postage stamps printed in multicolor by a single pass through the intaglio press.

Two Notable Sets of Postage Stamps

Many of our Presidents have shown an interest in the designs of currency and postage stamps, but none more so than President Franklin D. Roosevelt. It was at his suggestion that a new issue of ordinary postage stamps, honoring the Presidents of the United States, was created in 1938. Appropriately, the set of stamps became commonly known as the Presidential series and continues so today even though the issue has been replaced by new designs of the 1954-59 series. This Presidential interest is matched on the part of John Q. Citizen who keeps a watchful eye over security designs, especially those



Prizewinning design for 1938 Presidential series of postage stamps.

of postage stamps. He is quick to spot what he considers an inaccuracy—the position of a plane in flight is contrary to aerodynamic principles, a mode of dress is not historically accurate, the type of firearm shown is not the kind commonly used during the period the stamp commemorates. (The Mississippi Territory commemorative stamp of 1948, although it followed the Presidential set by 10 years, is a good case in point. Featured in the design of this stamp is the seal of the Mississippi Territory copied in its original form wherein the name appeared as “Mississippi.” The situation resulted in a volume of letters from the public pointing out the supposed omission of one “s.”) For this reason, considerable effort is expended on the part of the Bureau’s staff of designers to create a design that is not only esthetically attractive but accurate in all details.

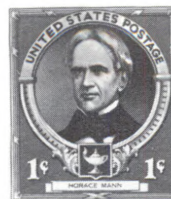
The work relating to the preparation of the Presidential series involved one of the most formidable research projects ever undertaken by the Bureau. The basic design for this series was selected as a result of a national competition conducted by the Painting and Sculpture Section of the Treasury Department’s Division of Procurement, the first such competition ever held for a postage stamp design.³ The winning entry depicted a bust of

George Washington in profile position. Consequently, it was incumbent upon the Bureau to search out sculptures that would be suitable for copying in preparing the designs for stamps of the other Presidents. Success was attained in this regard with exception of the stamp depicting President Taft which was based on a profile photograph. Eleven of the likenesses were copied after medals struck by the Bureau of the Mint.

The set is distinctive for its simplicity, number of denominations, and subject matter. It was the first time that the likenesses of many of the Presidents had ever been shown on postage stamps. The only then ex-President not included was Herbert Hoover. This omission was necessary because of the Federal statute (14 Stat. 25) prohibiting the likeness of a living person from appearing on a U.S. security. President Roosevelt took a keen interest in the preparation of this issue of stamps. He suggested that a distinction between the three ranks of values, essential for the quick processing of mail by postal clerks, could be attained by adding to the basic design a simple frame for the middle values and a double frame for the higher denominations. The frames were included and a further differentiation was achieved in that the \$1, \$2, and \$5 stamps were printed in bicolor. The basic design of these three stamps was developed by a Bureau designer.

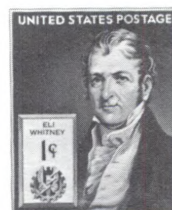
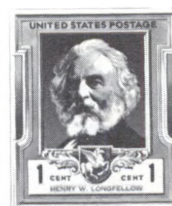
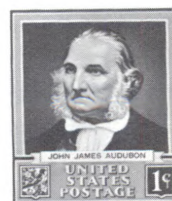
In order to maintain a direct relationship of the denominations to the numerical order of the Presidents, insofar as was practicable, the three stamps of fractional value required by the special postal rates then in effect were of designs other than Presidential likenesses but compatible

³ There were 1,027 designs submitted. The winner of the competition was Elaine Rawlinson of New York City who was awarded \$500 for her design. Charles H. Bauer of East Orange, N.J., received \$300 as second-place winner, and a husband-wife entry by the Erwin Austins of Delmar, N.Y., took the third prize of \$200. Neither of the runner-up designs was ever used for postage stamps.

**Artists.****Authors.****Composers.****Educators.**

with the general overall theme. This relationship was maintained through the 22-cent denomination depicting Grover Cleveland. Thereafter the likenesses of the remaining Presidents were assigned to other denominations consistent with postal charges. The 1/2-cent stamp portrayed a bust of Benjamin Franklin; the 1 1/2-cent, that of Martha Washington; and the 4 1/2-cent value, a vignette of the southeast view of the White House.

Up until 1940 when the Post Office Department inaugurated the Famous Americans series of postage stamps, little recognition had been given to the Nation's cultural heritage in the way of stamp issues honoring illustrious Americans in the fields of art and science. Previously the greater number, by far, of the portraits shown on postage stamps had been those of statesmen, war heroes, and personages connected with significant developments in our Nation's history. From time to time proposals had been made that various Americans renowned for other reasons, particularly in the categories of letters, music, and mechanical inventions, should be so honored. A comprehensive study made in 1935 by a former Post Office Department official and reported in a philatelic magazine showed that of the 69 eminent Americans selected for recognition in New York

**Inventors.****Poets.****Scientists.**

University's Hall of Fame up to that time, only 15 had been honored by having their portraits appear on postage stamps. Requests for philatelic recognition of "heroes of peace" grew more numerous with the issuance of the Army and Navy commemorative stamp set of 1936-37 which portrayed 18 of the country's military heroes.

In early 1939 the Post Office Department made known that serious consideration was being given to the issuance of a set of stamps commemorating outstanding men and women of our Nation and that it would welcome suggestions from the public of names of the persons to be included in the group. In July of that year, Postmaster General James A. Farley announced that such a series would be issued embracing seven classifications of the arts and sciences. Each classification would comprise a 1-, 2-, 3-, 5-, and 10-cent stamp. The groupings chosen were artists, authors, composers, educators, inventors, poets, and scientists. At the same time announcement was also made of the names of the 35 individuals selected to be pictured on the stamps. The denominational assignment in each group was determined on the basis of the chronological order of the birthdates of the persons portrayed. These persons represented periods from prior to the birth of our Republic to the 1930's.

The preparation of this issue presented a research task of unusual magnitude for the Bureau's designing staff. After the basic designs for each of the respective classifications had been prepared and approved it was necessary to find portraits of the designated persons that would form an esthetically pleasing design for

each stamp. An effort was also made to locate portraits which depicted these persons in their most productive years. In order to do justice to the design patterns, the Post Office Department approved increasing the size of these stamps slightly over that of the ordinary postage stamp. The press-plate size for this issue was 280 subjects rather than the usual 400 subjects. The work was produced on rotary plate printing presses and constitutes the largest set and one of the most voluminous issues of commemorative stamps ever manufactured by the Bureau.

Since the issuance of the 35 original stamps, the Bureau has printed the 14 additions made to the Famous Americans series by the Post Office Department.

Food and Cotton Order Stamps

Among the methods introduced by the Government for making use of surplus farm products were the food- and cotton-stamp plans begun in 1939 and continued until 1943. The stamps used in connection with these programs were produced by the Bureau.

The first plan effected was that of the food program. The Department of Agriculture, under which the plan was administered, described it as an attack upon an acute economic problem and as a means of lifting the nutritional standard of health of low-income families. The plan involved the use of two stamps, each having a value of 25 cents. One, designated as a food order stamp, was printed in orange; the other, the surplus food order

stamp, was blue. Briefly, the mechanics of the plan provided that certain qualified families could buy a controlled amount of orange stamps and would receive free a quantity of blue stamps equal to half the value of orange stamps purchased. Both were spendable at the grocery store of the purchaser's choice; however, the blue stamps were good only toward the purchase of food products designated by the Government as being in surplus supply.

The plan was first instituted on a limited basis, but soon spread to wide use throughout the country. In the first year of production, beginning in April 1939, orders were received for approximately 2 million books comprising over 60 million stamps. After the stamps were plate printed, they had to be gummed, perforated, cut, and assembled, with paraffin-sheet inserts, into 13 different series of books, according to designated quantity and combination of the 2 varieties. Originally, they were printed in 96-subject sheets on flatbed plate printing presses. Later, the plates were increased to 200-subject and finally, as the scope of the program spread, the production was changed from flatbed to rotary presses.

In February 1940, the Bureau began printing 25-cent green cotton order and brown surplus cotton order stamps for the Department of Agriculture. Both varieties of these stamps were printed from 200-subject plates on rotary plate printing presses. They were processed in the same manner as food stamps, and the finished items were assembled in nine different combinations of book values. Particular significance was attached to this new stamp program because the outbreak of war in Europe had caused a severe reduc-

tion of U.S. cotton exports. In its essential details the cotton-stamp plan followed the pattern established earlier for the food-stamp plan. The Government gave surplus cotton order stamps to eligible needy families in an amount equal to their purchases of regular cotton order stamps. Surveys showed that these stamps were principally used in the purchase of such cotton items as bedclothes, work pants and shirts, dresses, and piece goods.

The assembling and binding of the food and cotton stamps into booklet form was one of the most complicated jobs ever handled by the Bureau. The demand for these items was so great that a special organizational unit was set up to handle this work exclusively. By 1943, when the programs were terminated, over 3 billion of the stamps had been shipped by the Bureau.

A second food distribution program was established by the Government in the spring of 1961 on a pilot basis in eight areas of chronic unemployment throughout the country. Secretary of Agriculture Orville L. Freeman referred to the new program as "another in a series of actions . . . taken to put this country's food abundance to work to meet the needs of American families in distressed circumstances." The program, which is still in effect, is operated in a manner similar to that of its predecessor of the 1939-43 period, but is geared to the changed conditions of the 1960's and is a joint Federal-State venture.

The Department of Agriculture once again called upon the Bureau to produce the needed stamps, this time referred to as food-stamp coupons. Requisitions were placed for a red 25-cent and a \$1

gray stamp, each about the size of a dollar bill, to be made up in separate books as well as in books containing a combination of the two values. These stamp coupons were plate printed and were the first items this large to be printed on the Bureau's web-fed rotary presses.

In the course of time the program was extended to include other than the originally designated areas. With this expansion the title of the items was changed appropriately to that of food coupons and

the denominational values were increased to 50 cents and \$2. Orange and blue were the respective color selections for these revised values. Under the new arrangement the use of a combination book was discontinued and each denomination of the coupons is now prepared in two different values of books. Through June 1962, the Bureau had delivered approximately 6 million books comprising more than 48 million of these stamps and coupons.

CHAPTER VII World War II Years— the Bureau on the Homefront 1941-1948

THE OUTBREAK OF WAR with the Axis Powers in December 1941 found the Bureau in a much stronger position to cope with the ensuing emergency situation than at the beginning of World War I. Currency was being printed in sheets of 12 notes rather than 8; the issuance of national bank currency, calling for a multiplicity of notes for the various banks, had been discontinued; the development of electric-eye equipment for perforating postage stamps had brought about a material reduction in spoilage of this class of work; an annex building had been erected; and the Bureau was already engaged in a production program for defense savings bonds which greatly facilitated the transition to printing and processing the astronomical quantities of war savings bonds that were eventually required.

The national defense programs initiated about a year before the outbreak of hostilities and the war effort itself brought about a vast increase in the work of the Bureau. Printing orders were received for unprecedented amounts of bonds, certificates, and other items needed for war financing. The need for currency and stamps also expanded enormously, and new items for the War and Navy Departments were ordered in quantities which previously would have seemed fantastic.

The major difficulties which confronted the Bureau were those of securing sufficient help and obtaining the supplies and materials necessary to fulfill the demands made upon the agency. Additional personnel had to be found quickly, employees had to be trained to handle new work, and auxiliary workshifts had to be organized to utilize available equipment and workspace to the best advantage. Women employees volunteered for assignments normally handled by men.

Authority was obtained in certain instances to retain employees beyond the established retirement age and to rehire retired personnel. By the end of 1943 Bureau employment reached a peak of 8,398 employees, exceeded only by the high of World War I. Securing supplies and materials became extremely complex and difficult as the war continued. Like other manufacturing plants throughout the country, the Bureau had its problems in this regard. Bureau employees coped with ration coupons at home, gas coupons to get to work, and having arrived there had to cope with shortages of such mundane items as nails, cheesecloth, soap, wax, and the like. Nevertheless, the problems were overcome, improvisations were made, and the work was accomplished. In many instances it was necessary to assist paper manufacturers and contractors supplying other Bureau-needed commodities in securing raw materials which were in critically short supply. This required almost continuous correspondence with various governmental control agencies and the filing of applications, statistical reports, and similar documents. In some cases, the matter was of such urgency that special conferences had to be arranged with appropriate officials of those agencies to justify the need for the priority or allocation requested.

The demands made upon the Bureau for its services were many and varied. A review of activities over the period of the war years might give the impression that the Bureau's productive capacity was unlimited. The greatest demands fell in the field of war-financing and monetary measures—war savings bonds

and special currencies for protective and military use.

A striking illustration of the requirements fulfilled by the Bureau is seen in a comparison of the maximum daily production of war bonds during the two World Wars. In World War I the delivery schedule reached a peak of a half million Liberty Loan bonds per day, while in the second war period the Bureau attained a daily production of 1¾ million war savings bonds and even as high as 2 million bonds on two occasions.

A news release issued by the Treasury Department on March 14, 1945, gave the following explanation of the need for wartime currencies:

The wide geographical scope of military operations in this war and the great development of techniques of economic warfare have made money an important offensive and defensive weapon of war. . . . Just as we need many varieties of military weapons, of ships and of planes, so we have found that the effective conduct of war on the financial side requires a variety of currency measures designed to meet varied and changeable situations.

War Savings Bonds

With the threat of war in early 1941, the Treasury's then current program for the sale of savings bonds was a readymade vehicle for the promotion of national unity. The program was enlarged to provide a channel for united patriotic action and popular participation in underwriting national defense.

The enlarged bond sales program centered around a savings crusade for everyone, with emphasis on protection for the small investor. The type of bond was

right at hand. With very little change, the "baby bonds" were replaced beginning May 1, 1941, with defense savings bonds, later to evolve into war savings bonds. They were nontransferable, readily redeemable, and registered against loss through accident, fire, or theft, thus overcoming the drawbacks associated with the Liberty Loan bonds of the First World War. By and large, the greatest sale of bonds was made through personal solicitation on the part of innumerable volunteers. These voluntary salesmen came from everywhere—from insurance companies, banks, civilian defense rosters, business, fraternal and veterans' groups, churches, and labor unions. They included Boy and Girl Scouts, schoolchildren, rural mail carriers, and housewives—literally they came from all walks of life.

The backbone of the continuous sale of bonds was the payroll savings plan, an installment buying method under which anyone paid wages or salary could have his employer withhold a specific sum from each paycheck toward the accumulation of the purchase price of a bond. At the height of the war it was estimated that about 27 million workers, including members of the armed services, were putting \$500 million monthly into the purchase of bonds.

Keeping abreast of the demand created by the volunteer sales force and the savings plan put a severe strain on the Bureau's production facilities. One of the first steps taken was to increase the plate-subject size from two bonds to four. Operations at the time were geared for delivery of approximately 200,000 bonds daily. Immediately following the attack

on Pearl Harbor, daily production was increased to 700,000. The work of collating the bonds with their tabulating punchcard assemblies and stitching the items had been done manually, up to that time, because of the relatively small number of bonds required. The suddenness of the increase would not allow for immediate mechanization of the operation; therefore, it was necessary to hire several hundred new employees and nine separate rooms were required as workspace for processing the bonds. Actually, there was no suitable mechanical equipment on the market for handling work of this nature. Therefore, the Bureau purchased four secondhand gathering and stitching machines and redesigned them for its needs. With the installation of this equipment, new methods and procedures were developed for processing the work. In order to coordinate the various functions involved in processing the bonds, a separate organizational component was established. All finishing operations were performed in this section, including numbering of the bonds in sheet form, cutting of the sheets into single bonds, mating the bonds with registration cards by serial number, stitching of the items, final examination of the work, replacement of defective stock, and arrangement of the finished bonds in numerical sequence for delivery to the Bureau of the Public Debt. Shortly after the four machines were placed in service the production schedule was increased to a million bonds daily. Therefore, six additional machines were purchased, reconstructed, and placed in operation. During the early part of 1943 the requirements for war savings bonds



Trimming and perforating War Savings bonds.

became such that the 10 gathering and stitching machines in service were inadequate for the task. Sufficient space was not available to accommodate additional equipment. Further radical changes in the design and construction of these machines were necessary. At the same time it was decided to redesign the bonds and they were reduced to half their former size. This permitted an increase in the productive output of the printing presses as well as that of the processing equipment. For instance, through the decrease in the size of the bonds and the further improvement devised for the collating machines, the capacity of each of these machines was increased from an average of 34,000 bonds per 8-hour shift to 55,000.

A Dime at a Time

As the national defense financing effort gained impetus, the Treasury arranged with the Post Office Department to replace the latter's then current issue of postal savings stamps with another that could be used in the purchase of savings bonds. These and their successors were the savings stamps that were to become so familiar to the youth of the country during the defense and war years. The choice of design for this new issue was a reproduction of the famous statue, "The Minute Man" by Daniel Chester French erected at Concord, Mass., in honor of the heroes of the first battle of the War of Independence. The design was a fitting



The 10-cent "Defense" savings stamp. These stamps were also issued in 25-cent, 50-cent, and \$1 denominations.

symbol of "America on Guard" and representative of the volunteer nature of the defense savings program.

The forerunner of the stamp was the lowly 10-cent item introduced with the inauguration of the U.S. Postal Savings System created by law in 1911. The program was set up by the Government to encourage thrift, to attract savings of depositors who lacked confidence in private banks, and to provide savings facilities in communities where adequate banking service did not exist. The postal savings bonds, certificates, and stamps embodied in the program were produced by the Bureau.

In October 1942 the issuance of stamps in connection with the system was discontinued and that particular facet was taken over by the Treasury Department in conjunction with its campaign for the sale of savings bonds. The change gave birth to a substitute, the war savings stamp. Though the basic design of the new item was altered from that of its predecessor, the prime feature of the reproduction of the now well-known Minute Man statue

was retained.

The stamps were sold in post offices and in schools across the Nation to an estimated 25 million students and were exchangeable for savings bonds. Stamp booklets were made available to encourage children to save "a dime at a time," usually on weekly stamp sale days at school, just as their mothers and fathers "backed the attack" at their places of employment through participation in the payroll savings bond allotment plan.

The patriotism and wisdom of American youth—for though the sale of stamps was not limited to children they were the principal purchasers—are well illustrated by the fact that from July 1, 1941, through June 30, 1946, the Bureau produced and delivered more than 8,100 million savings stamps of the various denominations with a total face value in excess of \$1,700 million.

Since the end of World War II, the program has been continued in thousands of public and private elementary and junior high schools. Over 6 million students are in schools where they can buy savings stamps and bonds. In 1958 the Bureau produced the first bicolor savings stamp. Its red, white, and blue design still features the Minute Man statue, with the American flag added in the background.

Money as a Weapon

The infamous Japanese attack on December 7, 1941, on Pearl Harbor had sunk half of the American fleet, with the exception of the carriers, and had reduced our Pacific seapower to a dangerous low.

Guam and the Philippines soon fell to the enemy. Retaliation by way of a token bombing of Tokyo had been made in April of 1942, followed within a few months by a defeat of the Japanese fleet in the Battle of the Coral Sea and the staggering blow to the enemy inflicted in the Battle of Midway. In spite of these American victories the Japanese were becoming entrenched in various Asiatic areas and other Pacific islands. Responsible U.S. naval and military leaders were quick to quell any premature optimism, pointing out that the threat of an invasion of Hawaii still existed. It was against this background that the Treasury Department decided to withdraw all U.S. currency of regular design from circulation in the Territory and to replace it with a special issue of notes for exclusive use there. This action was necessary as a step toward the complete economic defense of Hawaii. Thus the Bureau was called upon for the first of the wartime currencies.

The special Hawaiian issue comprised \$1 silver certificates and \$5, \$10, and \$20 San Francisco Federal Reserve notes. The bills were identical in basic design to the regular denominations of the two classes of currency. However, the Treasury seal and the serial numbers were overprinted in brown rather than in blue which was the designated color for silver certificates, or green for Federal Reserve notes. In addition, all denominations of the special currency were overprinted with the word "Hawaii" in bold type at both ends of the face of the notes and across the back in large skeleton letters. The bills were serially numbered in successive sequence with regular notes of the

respective denominations and classes.

The original order for the work was received on June 8, 1942, and the first delivery of the notes was made that same day. The bills were placed in circulation in the Islands in July and no other U.S. currency could be held or used there after August 15, 1942, without a special license from the Governor of the Territory. Likewise, the export of the special notes to the U.S. mainland was prohibited in order to effectuate the purpose of their issuance. Had the Japanese conquered Hawaii, the distinctively marked currency would have made it possible to take appropriate measures to prevent the enemy from using the money to any advantage.

Early in 1944 Hawaiian currency served an offensive purpose. American military personnel in their invasion of the various Japanese strongholds in the Central Pacific zone brought with them supplies of "Hawaiian dollars," not only for their own use but for the use of the inhabitants of the areas taken over. This step was to facilitate identification of the currency being used in the combat zones and to make isolation of this particular currency easier in the event that military reverses caused any substantial amount to fall into enemy hands.

On October 21, 1944, the Treasury Department announced that the economic controls in the Hawaiian Islands, of which the issuance of the special currency was a part, were terminated. No further issues of Hawaiian notes were made, but the outstanding notes were then permitted to circulate in the same manner as other U.S. currency both in Hawaii and on the mainland.

In all, the Bureau processed more than

66 million Hawaiian notes having a face value in excess of \$411 million.

The men engaged in the first American invasion operation of the war, that of North Africa in November 1942, carried with them "yellow seal" dollars. These were notes that had been produced by the Bureau at the request of the War Department some 2 months previously. The notes, like Hawaiian bills, were regular American currency with a distinguishing mark to permit segregation if the situation so required. The currency embodied \$1, \$5, and \$10 silver certificates on which the Treasury seal had been overprinted in yellow rather than in blue as was customary. It was anticipated that the invasion troops would encounter a great deal of U.S. currency being circulated in North Africa at the time of their arrival. In administering controls designed to keep the Axis Powers from realizing advantage from captured money, the Government was able to permit yellow seal currency to be brought into the United States under less restrictive conditions than regular currency, which might have been looted by the enemy. Yellow seal notes were also employed in the Sicilian operation. However, they were used there only a short while, for they were soon replaced by Allied Military lire notes, a special currency that had been secretly prepared in anticipation of the invasion of Italy.

When the invasions of Europe and Japan were being planned, it was evident that the Armed Forces would need some type of special money and stamps when they landed. From the outside, it was impossible to predict with certainty what would be encountered in enemy-held territory. The Germans had flooded Tu-

nia with French francs in hope of setting loose an uncontrollable inflation; in Sicily, they had ordered the banks to burn all Italian currency before the Allied liberating forces arrived. The United States and its Allies had to be prepared to stabilize financial controls quickly to meet both tactics, as well as other economic stratagems that might be employed. The troops had to be supplied an adequate amount of currency in order to be independent of local banks which might have been destroyed or be under the management of persons of questionable loyalty. Local services such as police and sanitary protection had to be established under native authority or military administration. Supply officers needed an acceptable medium of exchange to purchase supplies and services which the Army required from local civilians. All this had to be accomplished without risking the capture and subsequent use of regular U.S. currency which was negotiable all over the world. As an answer to these needs, it was decided to print special military currencies in the monetary units of the respective countries. This currency was legal tender only in the individual country for which it was made and was under direct control of the Commander in Chief of the Military Government there. Local administrations or central banks in the liberated areas were solely responsible for the redemption of the currency. U.S. dollars were used as reimbursement only to cover troop salaries and certain other strictly military expenditures. The occupied countries were obligated for the money spent for food, supplies, etc.; redemptions, in effect, were made part of their reparations.

During the war years, the Bureau supplied more than 5 billion notes and almost 1½ billion postage stamps for use in Italy, France, Austria, Germany, and Japan. From the standpoint of physical undertaking alone, there was no precedent for such a job. For the most part, the work was produced for the War Department; however, issues of franc notes were produced for the French Committee of National Liberation and the Provisional Government of the French Republic. Japanese notes were also printed for the Navy Department.

The preparation of the military and occupational currency in advance of the invasion of Italy is itself an amazing chapter in the story of the gigantic and minutely detailed planning that preceded the military operation. The planning of the monetary project began in July 1942 when officials of the Treasury, War, Navy, and State Departments and of the British Government laid the groundwork in a series of extraordinary conferences. No inkling of the project was put in writing, no word of it was spoken over a telephone, and it was not discussed outside the conference rooms; the information would have been invaluable to the enemy by disclosure of the forthcoming military expedition.

The intaglio printing process is recognized as the most effective means for providing security against counterfeiting, but the manufacture of the required original dies, rolls, and plates involves tedious and time-consuming operations. If this method had been used for the production of invasion currency, it would have required an appreciable amount of time before sufficient quantities of notes were

made available. Multicolor lithographic printing was therefore selected as the process which could produce the largest and most rapid output with an acceptable degree of security. The operation was further expedited by the decision to confine the issue to two basic designs, those of large- and small-sized notes.

On March 24, 1943, the Bureau was instructed to proceed with the preparation of designs. Work was immediately begun in the Engraving Division and by March 29, models for the two varieties of notes were submitted for consideration. One was the size of a dollar bill and the other half that size. Designs were prepared in strict secrecy, and stocks of special security paper and huge amounts of the ingredients for inks of various colors eventually needed for the project had to be procured under similar conditions. The country for which the notes were intended was never identified at this preliminary stage. Any leak relating to the area in which the currency was to be used would have forewarned the enemy of the Allies' selection of the point of invasion and could have caused disastrous results. The title "United States" and the word "Dollar" were used fictitiously in preparing the basic designs where the term "Issued in Italy" and the word "Lira" were subsequently overprinted on the notes. Overlapping designs were developed and inks with specific spectral characteristics were chosen for the printing so that photographic separation of the various components of the notes would be extremely difficult, if not impossible. Pigments possessing maximum resistance to chemicals and fading had to be selected. New methods were



10-lire Allied Military Italian currency note (enlarged one and one-half times).

developed by the Bureau for accurate color control during the actual printing operation. This was necessary in order to maintain all the inks in positive balance to prevent photographic separation of the colors which would be an aid to counterfeiters in reproducing plates for surreptitious printings. Through a series of tests it was found possible to print the currency in sheets measuring 32 by 54 inches, which would accommodate 200 small or 100 large notes.

The Under Secretary of the Treasury approved the designs on May 10, 1943. Photolithographic plates were prepared and the printing of the initial order calling for 218,000 notes was begun on June

10, the day following receipt of the requisition. Though the term "Allied Military Currency" appeared on the face and back of the notes, the name of the country and the currency designation were still omitted. Offset presses were operated 24 hours a day doing the basic printing and making ready for the overprinting that would give specific identification to the currency. Huge stocks of the partially finished notes were accumulated awaiting the "go" signal.

The news of the invasion of Sicily by the Allied troops was flashed to the world on the night of July 9, 1943. It was not until July 13, however, that instructions were received to overprint on the faces

of the notes the identifying legend "Issued in Italy" and the denomination description "Lira." By July 19 two planes carrying 7 tons of the special currency took off for Italy.

Once the invasion was an accomplished fact, there was no need for the high degree of secrecy that had surrounded the processing of the original order for the Italian notes. Since the Bureau did not have the equipment suitable for the offset printing of the tremendous volumes of notes that were urgently needed, it arranged for the services of commercial firms to assist in the printing of the remaining orders for Italian currency as well as for all other invasion currencies. A contract was negotiated with the Forbes Lithograph Manufacturing Co. of Boston to do the preliminary printing of the remainder of Italian notes. The offset-printed stock produced there was transferred to the Bureau for over-printing the denominational values, series, name of the country, and serial numbers, and for shipping the finished notes. Similar arrangements were made with respect to the production of Allied Military German mark notes. All the printing operations, as well as the boxing and shipping of Supplemental French franc currency, Committee French franc currency, and certain denominations of Allied Military Austrian schilling currency, were performed by the Forbes firm.

Military Japanese yen currency for the War and Navy Departments was produced through arrangements made by the Bureau with the Stecher-Traung Lithograph Corp. of San Francisco and the State of California Bureau of Print-

ing at Sacramento. The notes were printed by the San Francisco firm and then transferred to the State agency for numbering, finishing, and shipping.

The Bureau arranged for the delivery of paper and provided the inks and the designs of the notes to be printed; the contractors, in turn, manufactured the plates for printing the currencies. Representatives of the Bureau were stationed at the plants to observe the progress of the work and to maintain control over the plates and printings. Upon completion of the projects, the designs were returned to the Bureau; the printing plates and other related material were destroyed at the plants under the direction of committees composed of representatives of the contractor, the U.S. Secret Service, and the Bureau.

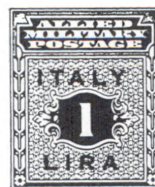
U.S. Secret Service personnel were assigned to the Forbes plant for the duration of the contracts and Coast Guardsmen were stationed at the west coast plants to insure that adequate protective facilities were maintained.

One of the major problems in the manufacture of invasion currency was the production of paper of the quality and amounts required. At various times, nine papermills were engaged in the task, and this necessitated preparation of detailed specifications which provided for technical tests to insure that the products of the respective firms were essentially identical. The specialized paper had to be suitable for multicolor lithographic printing and at the same time highly resistant to moisture, distortion, and wear. Only the finest materials could be used in its manufacture, and such materials were in critically short supply largely due

to demands of the armed services. The acquisition of high-quality cotton rags was a particularly troublesome matter. When the usual sources of supply failed, the Bureau made contact with some of the navy yards and quartermaster depots, from which cuttings from uniforms were acquired. Cotton linters, combings, and raw cotton were also utilized in spite of the fact that many changes had to be made in paper manufacturing operations. In addition to procurement problems, the Bureau had to cope with the development of new and different sizing materials for the paper. Although all this work, and much more, had to be accomplished on a very tight time schedule, the cooperation between the Bureau and the various manufacturers was such that the printing operations proceeded smoothly and the completed notes were delivered to the Army and Navy at the required times.

Military Postage Stamps

On July 1, 1943, less than a month after receipt of the initial order for a military currency, an order was received from the War Department for the production of a special companion issue of postage stamps. Here again, no indication was given as to the identity of the country in which the items would be used. Some preliminary work on the basic design and colors had already been undertaken on the basis of oral instructions and as quickly as this facet was completed and the choices were approved, the preparation of plates was begun. The first printing plate was certified and sent to press on July 17. At the time of receipt of the original orders, the invasion of



Italy had not yet taken place. However, when the printing of the postage stamps began there was no longer a need for secrecy and it was known that the stamps were for use there. Therefore, the printing of the basic design and the overprinting of the name "Italy" and the denominational value expressed in terms of "Centesimi" or "Lire," as appropriate, were accomplished in one operation on a two-color press. The work was printed at the Bureau by the offset process in 400-subject sheets, each subject being the exact size of the ordinary U.S. postage stamp. The paper used was a pre-gummed, unwatermarked, white sulfite stock. The printed sheets were perforated, quartered, banded into units of a hundred sheets of 100 subjects each, and packed in wooden boxes containing 300,000 or 600,000 stamps each, in accordance with War Department requirements. The initial delivery of the Italian stamps was turned over to the Army simultaneously with the first lot of lira currency on July 19. Orders were subsequently received and processed by the Bureau for additional quantities of Allied Military Italian postage stamps and for furnishing Supplemental French, Committee French, Allied Military German,¹ and Supplemental Austrian postage stamps.

¹The British Government independently produced some of the Allied Military German postage stamps.

Cloaks and Daggers and Currency

Guerrilla activities carried out by the Army and Navy brought the Bureau into even closer association with warfare in the Pacific areas.

In January 1943 the War Department had urgent need for a quantity of Philippine currency. It was planned to send small groups of soldiers to engage in guerrilla activities and harassment against the Japanese then occupying the Philippine Islands. As the men infiltrated strategic areas they would need a means to purchase supplies. It was imperative that the notes be of a worn condition, for the sudden appearance of newly issued, genuine notes would have tipped off the enemy that something was amiss. Here was a new task for the Bureau. Previously, it had always striven to have its products as perfect as possible—now, a used product was being asked for.

It so happened that the Bureau had on hand large stocks of finished Philippine currency notes being held in safekeeping. A quantity of these notes had already been a "war casualty." They had been dispatched to Manila in November 1941 and were still on the high seas at the time of the Japanese attack on the Philippines in early December of that year. Consequently, the shipment was diverted to Australia and was eventually returned to the Bureau in April 1942. These notes, together with others in storage at the Bureau, were used to supply the Army's special requirements. They were properly "aged" with the assistance of the National Bureau of Standards. There the bills

were placed in a large cylindrical drum, 12 feet long and 4 feet in diameter. Next, a very special "dressing" was prepared—a mixture of sand, floor sweepings, and soggy, used coffee grounds. This concoction was put in with the notes and the contents of the drum were tumbled at 60 revolutions per minute for several hours after which the currency was well worn in appearance.

A small group of Bureau of Engraving and Printing employees, together with a few persons from the Office of the Treasurer of the United States, all sworn to secrecy, assisted in counting and preparing the notes for shipment. Within 3 days after the project was started, the first delivery of the "used" pesos was turned over to the War Department for dispatch by Army plane to the rendezvous. A similar shipment was subsequently prepared and dispatched in September 1943. Later, on two other occasions the Bureau cooperated with the War Department in furnishing quantities of Philippine currency for military use. In these cases, though there was no need to age the notes, it was requested that the currency furnished be of any issue prior to the 1941 series, because one of a later date would make it "subject to suspicion in connection with the purpose for which it was being used." Since the Bureau had no stock of Philippine currency of a previous issue on hand, it was necessary to print the quantity requested from plates that were still available for the 1936 series of notes for the Commonwealth.

Another top-secret job involving Philippine currency was executed for the Navy Department in August 1944. This involved the preparation of 5,000 packages

designated as "Aviators' Emergency Money Packets." Each was made up with a variety of notes having a total value of 100 pesos, in sealed, watertight containers. The packets were distributed by the Commander of Aircraft, Pacific Fleet, to 35 aircraft carriers with instructions that all crewmembers who flew in the Philippine area were to be furnished these packets for use in case of emergency should their planes be downed in enemy or neutral territory.

At the time, these operations were known only to the few officials and employees who worked on the projects. The lives of innumerable service personnel depended upon the utmost secrecy regarding the transactions. Therefore, no bookkeeping entries were made regarding the deliveries. All records were placed in sealed envelopes and held by the Office of the Treasurer of the United States in safekeeping until after the close of the war. It was not until then that adjustments were made to the accounts and the Bureau's part in the supersecret projects became generally known.

"Overrun Countries" Stamps

In 1943 the Post Office Department decided to issue a series of stamps honoring those nations that had fallen victim to the Axis Powers. It was proposed that these stamps be printed with the flags of the respective countries in true color. Inasmuch as the Bureau did not have suitable equipment for the expeditious production of stamps in multicolor, it was necessary to subcontract the work to

a private firm. Thus for the first time since 1894 an issue of U.S. postage stamps was printed outside the Bureau. There were 13 stamps in all, honoring Albania, Austria, Belgium, Czechoslovakia, Denmark, France, Greece, Korea, Luxembourg, the Netherlands, Norway, Poland, and Yugoslavia. The stamps were designed and printed by the American Bank Note Co. in New York. A representative of the Bureau was stationed at the printing plant for the duration of the contract.

The borders were printed from engraved plates and were the same for all stamps of the series. The central design for each stamp was a reproduction, in appropriate colors, of the flag of the particular country and was produced by the offset method.

"R" and "S" Notes

The Bureau has a "tale of woe" to relate to those claimants that the American public in general is nonobservant regarding the physical aspects of its paper money—that so long as it is genuine and spendable, the ordinary citizen is not too concerned about its looks. The Bureau has reason to believe otherwise.

Early in 1944 experiments aimed at improving the quality of currency paper indicated that the addition of certain chemicals during its manufacture might prove advantageous. In order to evaluate the findings it would be necessary to produce a quantity of notes on paper embodying these special chemical features; then to issue these notes together with a quantity printed on regular paper for

comparison of the serviceability of each type under similar conditions. This was accomplished by simultaneously issuing identical lots of \$1 silver certificates printed on the two kinds of paper. Notes of the special paper bore a small, capital "S" printed in red on their face in the lower right corner adjacent to the Treasury seal. Those printed on regular paper were similarly identified with the letter "R." Arrangements were made with the Bureau of the Public Debt that it would report on the number of marked notes of both types turned in for redemption during specific periods. Such statistics would materially aid in evaluating the special paper.

Approximately 1 million notes of each type were placed in circulation in June 1944. A few months later the notes began to trickle in for redemption but, unfortunately, the trickle did not grow to the anticipated geyser size. The returns never reached a volume sufficient for making a valid analysis.

Although no publicity was given to the issuance of the test lots, the public at large apparently was quick to observe the special markings on the notes. Rather than spend the bills and keep them in circulation, John Q. Citizen evidently decided to retain those notes that came his way as curios. Thus the public's attachment for oddities brought the Bureau's efforts to naught. Spending the notes would have meant that they would eventually be presented for redemption because of their worn condition.

Today, 18 years later, some of these notes are still in circulation, for the Bureau continues to receive questions as to the significance of these "unique" bills.

Personal Effort

Bureau employees supported the civilian wartime programs with the same enthusiasm demonstrated by their predecessors a quarter-century earlier. They raised over \$1,200 in the spring of 1941 through benefit entertainments and transferred the sum to the American Red Cross to purchase a mobile canteen for the citizens of London. A unit of the American Red Cross was organized in the Bureau late in 1941 to assist in recruiting volunteer workers. The principal project undertaken by that group was sewing and knitting clothing for refugees in war-devastated lands; about 700 participating employees produced 11,485 garments. In addition, miscellaneous articles such as books, phonograph records, playing cards, and games were contributed by employees to the District of Columbia chapter for distribution to veterans' and military hospitals and servicemen's canteens in the local area. Courses in knitting were conducted and instruction was given in home nursing and first-aid procedures. Workers assisted in the preparation of surgical dressings, served as nurses' aides, and participated in the Red Cross Motor Corps' activities. Two picture engravers donated their talents sketching hospitalized servicemen. Every Christmas special projects were undertaken: in 1941 gift packages were sent to 51 employees then in the Armed Forces; in 1942 and 1943 the soldiers assigned to an anti-aircraft battery located on the roof of the annex building were treated to dinner and furnished gifts; in 1944, almost \$1,600 and quantities of cookies, candies, and tree decorations were contributed by Bu-

reau employees for parties for convalescent service personnel. On December 13, 1943, the Department authorized the inauguration of an extensive blood donor program sponsored by the American Red Cross, in which Bureau personnel participated. This program was later set up on a continuing basis similar to the Community Chest and war savings bond drives. An average of 15 donations per week was made by employees during the wartime period. The Bureau people were also zealous in the purchase of the products of their own labors—during the various war loan drives and the Victory loan drive and as participants in the payroll savings plan, they invested more than \$7,300,000 in savings bonds.

The Bureau as a Tourist Attraction

With the attack upon Pearl Harbor a squad of soldiers was immediately assigned to patrol the outside of the Bureau and the building was closed to visitors as a precaution against possible sabotage. On August 14, 1945, Japan accepted the peace terms of General MacArthur and on September 2, the formal surrender aboard the U.S.S. *Missouri* took place. A symbolic forecast of these events occurred with the resumption of public tours of the Bureau on June 12 of that year.

The moneymaking activities of the Bureau have always held a great fascination for the visitor to Washington. Spencer Clark, the first Chief, was not especially happy about the fact. In November 1865, and again in September 1866, he wrote the Secretary of the Treasury that

he felt that "the practice of granting passes for strangers to visit" the printing area should be limited because it was a "serious hindrance to the public business, as well as detrimental to the system of accountability established for its government." He went on to say—

I see nothing to commend in the practice. It would not be permitted in any other branch of the public service where values were handled. On the contrary I see everything to condemn. I therefore respectfully recommend that the practice should be discontinued, or be confined only to special cases, when, *within the Secretary's own knowledge*, or in pursuance to an official *recommendation from this Division*, there may be satisfactory reasons [for] admitting persons not employed upon the work.

Apparently Clark's recommendation relative to the pass system prevailed to a certain extent, for a guidebook on the city of Washington, written in 1874, noted that "you cannot enter [the Bureau] unless you hold a written 'sesame' from the Secretary of the Treasury; so sacred and guarded is this . . . precinct in which Uncle Samuel creates his 'Almighty Dollar.'"

George B. McCartee, Clark's successor, had troubles too in regard to visitors. In his annual report for the fiscal year 1875, he told of a loss of two sheets of \$10 notes amounting to \$80 "from theft perpetrated by visitors to the Bureau."

Upon the occupation of the first Bureau building in 1880, Chief O. H. Irish established certain rules for guides and visitors which stated, in part:

All persons desiring to witness the operations of the Bureau must obtain a pass from the Chief or Assistant Chief of the Bureau. These passes can be obtained

on application to the lieutenant in charge of the watch at the main entrance.

Visitors will be admitted only between the hours of 9:30 and 11:45 A.M., and between 12:30 and 2 P.M. They will register their names, will be placed in charge of the guides, and will be required to conduct themselves in an orderly manner. They will not be permitted to converse with employés, or to handle any of the impressions, plates, or representatives of value.

The number of persons to be admitted to the Bureau, as visitors, at any one time, shall not exceed thirty; nor shall a party to be shown through at any one time, by one guide, exceed five.

In 1885, further restrictions were placed upon the admission of visitors to the Bureau, for the annual report for that year cites that—

The indiscriminate admission of visitors to all branches of the Bureau seriously interfered with the work of the operatives, and required the employment of ten guides at a cost of more than \$4,000 a year, besides the occasional services of other employés. . . . As a result . . . the admission of visitors was stopped, except on Saturdays, and the guides discharged or assigned to other work.

By 1900, however, the practice of admitting visitors to the Bureau had been revived and a tour of the Government's money factory was once again a "must" for visitors to the Nation's Capital. A contemporary account described the Bureau guides at work, as follows:

. . . when a little group of visitors has gathered in the reception-room—as they are sure to do every few minutes every day—a young woman with a marvelously glib tongue requests the group to follow her, and she leads the way through those rooms opened to visitors. Again and again during the day she—as well as

others, for another party collects generally long before one has had time to go the rounds—repeats the same story to a group of interested and astonished people who come from all over the world. Her sympathizing sisters will ask her if she does not find it very tiresome saying the same thing over and over again, every day in the week, year in and year out, and she will smile sweetly and say that sometimes she does; and they will ask her how much she gets for it, and she will tell them \$1.50 a day, just as if everybody had a perfect right to know. Others will try to encourage her by saying that it must be agreeable to meet so many people and tell them so many things they never knew before; and she will smile again, just a little incredulously, and beckon another party to follow her around; and . . . after her weary day's work . . . she very likely thinks . . . that her position is by no means a sinecure.

The Bureau had become such a popular and well-established tourist attraction that, when the main Bureau building was constructed, provision was made for mezzanines in the various workrooms from which the visitors could view the operations but would not come into contact with the work. Previously, in the old building, visitors had been escorted on tours directly onto the floors of the workrooms in areas screened off from the actual operations.

Literally millions of persons have visited the plant since that time. Except for periods during the two World Wars, the building has been opened to tourists each regular workday. For almost a year in 1938 and 1939, when the work program called for the operation of a night shift on regular schedule, tours were also conducted during evening hours from 7:30 to 9. In 1920, the first year for

which statistics are available relating to the number of visitors, 120,283 persons were escorted on tour through the Bureau. Down through the years that number has increased by leaps and bounds, reaching a high of 638,000 visitors in 1959. During 1962 more than 630,000 people visited "Uncle Samuel's" money factory.

The Case of the Russian Plates

Every once in a while there arises a rumor that during the war the Bureau turned over plates for printing U.S. currency to the Russian Government. Nothing could be further from the truth, but it is easy to understand how such a misconception could arise. This is the story of the "nefarious" Russian plates.

The last shipment of a military currency was made on October 17, 1945. A 3 years' effort begun in the secrecy of the preinvasion days of 1942 was brought to an orderly conclusion. The Bureau was proud of the part it had played, however small, in assisting the Armed Forces in achieving total victory. The memory of the stupendous quantities of military currency notes and postage stamps which had been produced was fast paling when in 1945 the Bureau was called upon for an accounting of its role. Congressional interest was aroused by reports that the U.S. Government stood to lose huge sums of money by reason of redeeming certain military currencies, and joint hearings were held regarding the matter by the Senate Committees on Armed Services, Appropriations, and Banking and Cur-

rency. The chairman of the joint committee explained:

[This] hearing is being conducted . . . as a means of inquiring into the circumstances surrounding our Federal Government's handling of occupation currency, particularly as applied to the occupied areas of Germany and Austria.

During the last several months considerable concern has been aroused . . . over reported losses that have been incurred by the War Department resulting from acceptance by Army fiscal officers of . . . occupation currency issued by the Russians.

* * *

[Among] reports that have caused the Senate committees grave concern [is one] . . . that the United States turned over the engraving plates to Russia, who forthwith began flooding the countries with exactly the same occupation marks used by the American military government.

This and subsequent congressional hearings brought to light "the story of the Russian plates," as it was dubbed by the daily press and news weeklies, and pointed up the Bureau's efforts to protect the integrity of the military currencies.

The account as developed from the testimony is a story of major and minor irritations and, as the then Director had noted, the matter was a "pretty trying assignment for all associated with it."

On February 15, 1944, the U.S. Ambassador to the Soviet Union sent a message to the Secretary of State to the effect that the Soviets desired to print a portion of the mark notes so that the Red Army troops could be assured a supply of currency when they invaded Germany from the east. They felt that the United States

would not be able to guarantee shipment in sufficient quantities for Russian needs because of the distance between the United States and Germany. They requested the plates and models of paper and colors for printing all denominations of the mark notes. The Director took sharp exception to this request. In a memorandum dated March 3, 1944, he pointed out six objections to compliance: (1) the violation of accountability principles in the dividing of security items; (2) the possible loss of the contractor's (Forbes Lithograph Manufacturing Co.) services if plates were removed from its exclusive custody. It was indicated that the Bureau, with only a single multicolor lithographic printing press, did not have the facilities for producing these large-scale orders unaided; (3) the possible variation in the notes produced by the Soviets due to differences in printing processes; (4) possible variation of the notes due to differences in ink and climate; (5) the probability that continuing assistance and consultation with the Bureau would be required (as it was with the contractor) to minimize the danger of counterfeiting; and (6) the risks involved in transporting of security items. As an alternative, the Director offered the services of the Bureau to assist the Russians in preparing a distinct currency for their use. Treasury Department officials were apparently convinced of the validity of the Director's arguments and drafted a cable to be sent to Moscow rejecting the request. However, upon reconsideration it was decided to comply with the Russian proposition. On April 21, 1944, there were released to the representatives of the

Soviet Government 23 glass positives and a like number of glass negatives for making plates to print the mark notes, together with samples of inks and paper, also drawings, specifications, and other related material. But the ordeal was only beginning. In May, another shipment of inks was being prepared, but the amounts as ordered by the Soviets were out of balance; they called for too much of some of the pigments. If the pigments were ordered in proper relationship to the ink formulas, there would be considerable saving in transportation costs. A conference was held in the office of the Under Secretary of the Treasury to explain the situation. Representatives from the State Department and the Bureau were present, as were several from the Treasury Department and the Russian Embassy. After a lengthy, detailed explanation, the Russian Ambassador curtly answered that he wanted exactly what was ordered—he made no attempt to analyze the proposition and was not willing to concede any change from the written order received from Moscow. On May 23 the Director sent a letter to the Under Secretary which concluded:

The third shipment was practically completed and ready to go when the letter was received yesterday from the Embassy changing the whole setup. It is necessary now to uncrate all of the material and rearrange the whole shipment. You will remember when we talked to the Ambassador, he insisted upon complying strictly with instructions he received from his government, and now that his government has reversed itself, we have to do the job all over again.

This has been a pretty trying assignment for all associated with it.

After further, somewhat less hectic arrangements, shipments of dry colors amounting to 5,516 pounds were prepared and dispatched on November 2, 1945, and February 11 and 21, 1946.

The forming of the joint committee and the holding of hearings on the matter of turning the mark currency material over to Russia proved prophetic a mem-

orandum written by the Director on April 15, 1944, in which he predicted:

From the first time the Russian request came to my notice I have strenuously objected, in oral argument and in writing, to furnishing duplicate glass positives of the Mark currency to the Russian Government. There may be serious repercussions when this transaction becomes public information.

CHAPTER VIII Technological

Advancement—new ways for old 1949–1962

THE FILES OF THE Bureau contain innumerable reports of the achievements attained throughout its 100 years in improving the materials and processes used in its production operations. These same records bear witness to the constant effort expended in maintaining the superior standard of quality befitting U.S. securities. Early recognition was given to these endeavors in June 1866 by Congressman James A. Garfield, who was later to serve as President. At that time, when the matter of dry printing of currency was the subject of considerable debate in the House of Representatives, Garfield stated:

Within the past few months one of the most accomplished engineers of England has visited the printing establishment of the Treasury Department, and he declares the printing machinery now in use there to be a masterpiece of skill in mechanics.

The report of the U.S. Centennial Commission relative to the Bureau's exhibit displayed at the Centennial Exposition

held at Philadelphia in 1876 was evidence that the fledgling bureau was fast maturing. In the opinion of the judges for the exposition, the Bureau engravings were in accord with the "highest present standard of art in design and execution and are worthy of the National Institution" The officials explained that the "printing [of the engravings] is perfectly done and bears witness to the employment of the

best skill and materials, and of highly-improved machinery and process."

Constant improvements of the plant facilities were made throughout the years. In 1903, the Director reported:

Special efforts have been made during the year to improve the machinery and appliances used in the work of the Bureau, with very satisfactory results. A new light and power plant has been installed, which has a capacity to furnish not only all of the light and power of the Bureau at present, but to permit of considerable increase in the future. It is proposed to operate all of the machinery, as far as is practicable, by direct electrical connection, thus dispensing with cumbersome belts and pulleys. . . . The plant of the Bureau is now one of the most complete of its kind in the world.

The economies resulting from the various innovations were substantial as illustrated by a report of 1911 that improvements in Bureau operations had saved more than a half million dollars over a period of the preceding 3 years. The report added: "Notwithstanding these large savings, it is expected that further reductions in cost will be made in the next fiscal year on account of additional improvements in the machinery and methods." The saving to the Government through the introduction of small-sized currency notes in 1929 was estimated in excess of a million dollars annually.

In keeping with this tradition, a two-phase modernization program of technological improvements was begun by the Bureau shortly after the close of World War II. The first phase involved the development of various adjuncts to the existent flatbed plate printing presses, as well as improved materials used in the production of currency. The second

phase was devoted to the development of substantially new sheet-fed and web-fed high-speed intaglio presses for the production of both currency and stamps.

Nonoffset Inks

One of the primary concerns of the first phase of the improvement program was the elimination of the offset characteristic of green ink used in the printing of currency backs. It was apparent that if this problem could be overcome many other advancements would result as a matter of course. For example, it was necessary to tissue the work by hand as it was taken off the press to avoid smudging and to prevent the offsetting of an impression from one sheet onto another. A nonoffset ink would eliminate the need for tissueing. It would also make possible the storage of the printed backs in such a manner that the ink would set but the paper itself would remain dampened. This would obviate the need to dry the work and then rewet it preparatory to printing the faces. Further benefits of a more technical nature would then ensue. Since distortion increases with sheet size, the 12-subject sheet was the largest size practicable at that time for printing currency because of the double wetting of the paper. (It was also necessary to wet the blank paper prior to printing the backs.) Elimination of the drying and rewetting of the printed backs would permit the use of a larger sheet, without creating serious complications in succeeding steps of the processing. The result would be increased production without additional manpower.



Compartments used for the drying of securities plate printed by the wet method.

A nonoffset green ink was developed by the Bureau in 1943 but, unfortunately, it did not prove effective under production conditions. The extensive potential benefits of such an ink warranted continued laboratory research on the project. However, this research was necessarily conducted on a curtailed basis because of the wartime conditions of the lack of manpower, difficulty in acquiring materials, and the need for concentration on the development of suitable inks for printing the military currencies. Initially, modifications were made to the dry ingredients of the ink; namely, the pigments and extenders. Production tests indicated the need for further changes in the ink formulation and the Bureau chemists varied the nature of the liquid components—vehicles and binders—used in

the manufacture of the ink, since these components concerned surface tension and other physical properties which would affect the offset characteristic of the ink. The breakthrough came in 1950. Complete conversion was effected in 1951, and the optimistic expectations of the use of nonoffset green ink proved justified.

Humidors, designed and built by the Bureau, were used to store the printed backs while the green ink was setting. The boxes were so constructed that there was little or no loss of moisture from the sheets and thus the work could be face printed without a second wetting.

The beneficial results of the nonoffset green ink can be readily understood in reviewing the procedures in effect prior to its introduction. Previously, the printed backs were assembled in wooden trays in lots of a few hundred sheets. The trays were then transferred to drying rooms. In these rooms there were a number of metal compartments each equipped with a series of wire mesh shelving. Here the sheets were spread out uniformly on the shelves as the work was received. The compartments were closed at the end of the day's work and the room was locked. Hot air, heated to 210° Fahrenheit, was circulated through the units for a continuous period of 12 hours in order that the sheets would be sufficiently dried for handling on the following day. Next, the tissues had to be removed from the work, and the sheets examined and then rewet. Stringent security control which involved numerous counts as the work proceeded through the various stages had to be maintained at all times. All this processing caused

an interval of some 10 days between the printing of the backs and the faces. With the introduction of nonoffset green ink, these steps were eliminated. The work printed with the new ink was ready for face printing the very next day.

Encouraged by the success of the non-offset green ink, Bureau technicians then concentrated their attention on the development of a black ink of similar characteristics for use in the printing of currency faces. By July 1952, a suitable black ink was formulated and, by June 1953, it was utilized for all currency face production. It thus became possible to eliminate the work section devoted to tissue removal and to combine the examinations of backs and faces into a single operation.

18-Subject Currency

As expected, dimensional variations in the printed sheets were materially reduced through the elimination of the need for the first forced drying and the second wetting operation. In addition, there was a noticeable and welcomed improvement in the registration of the faces with the printed backs. These betterments were such that it was then feasible to plan for the printing of currency in larger size sheets. Detailed consideration was given to the multiple factors involved; such as, press size, auxiliary equipment capacities, handling facilities, and the like. It was determined that an 18-subject sheet represented the maximum capacity of the flatbed press and would be the most practical size. Thus occurred the first change in plate-subject size of

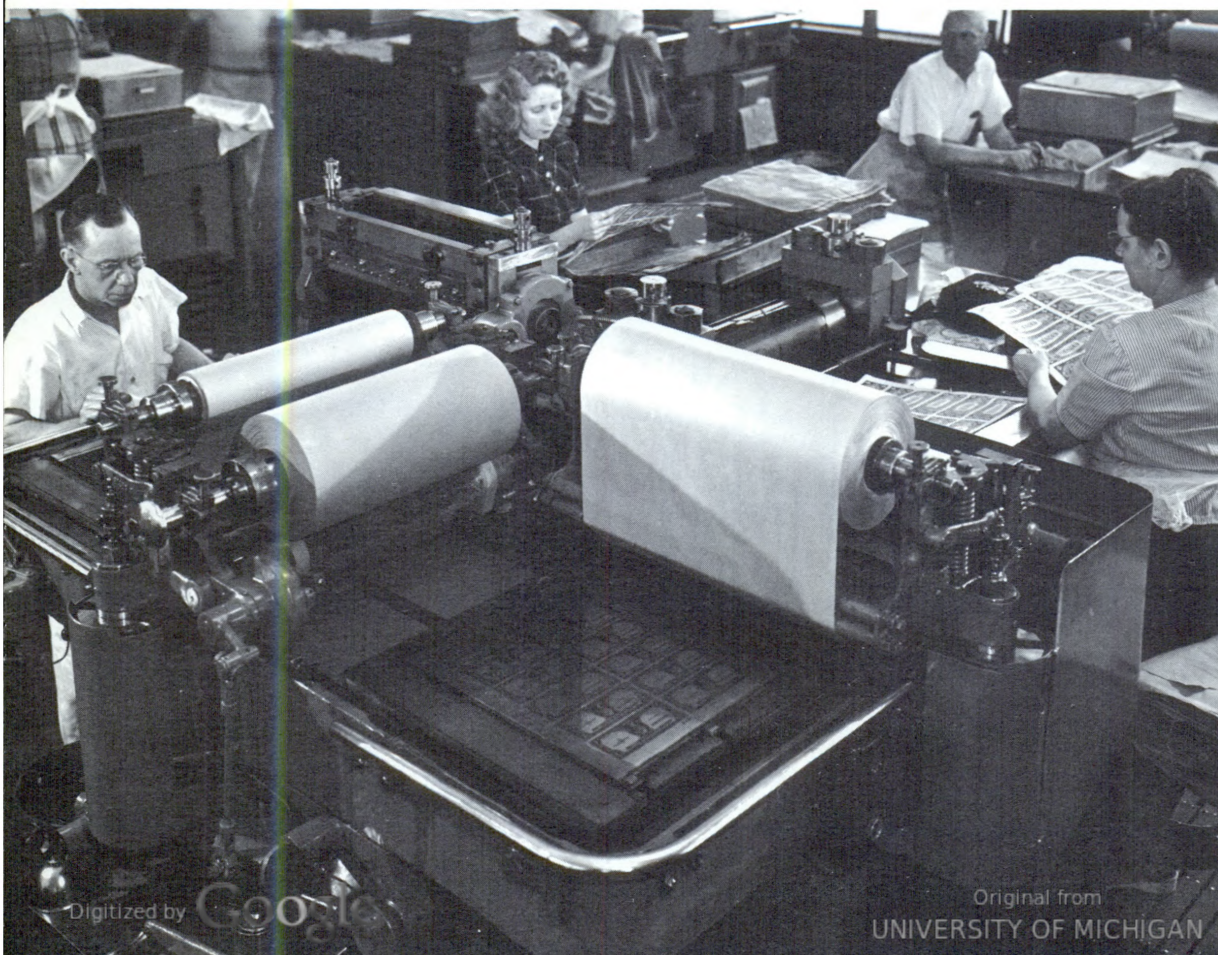
currency since the introduction of the small-sized notes in 1929. In spite of the many major changes necessary in the various types of processing equipment throughout the Bureau because of the innovation, the conversion to the larger sheet proceeded in a well-ordered pattern initiated in August 1952. All currency was being produced from 18-subject plates by September 1953. The changeover necessitated only one major adjustment in currency production operations and this was of a temporary nature. To get the new program underway at the earliest possible date, two-color typographic flatbed presses were purchased for use in overprinting the numbers, seals, and signatures on the larger size sheets until such time as two-color sheet-fed rotary overprinting equipment could be designed and developed. The flatbed presses performed satisfactorily during the very critical interim period of about 1 year and were replaced gradually beginning in 1953 by newly designed rotary overprinting presses which could process the work more rapidly.

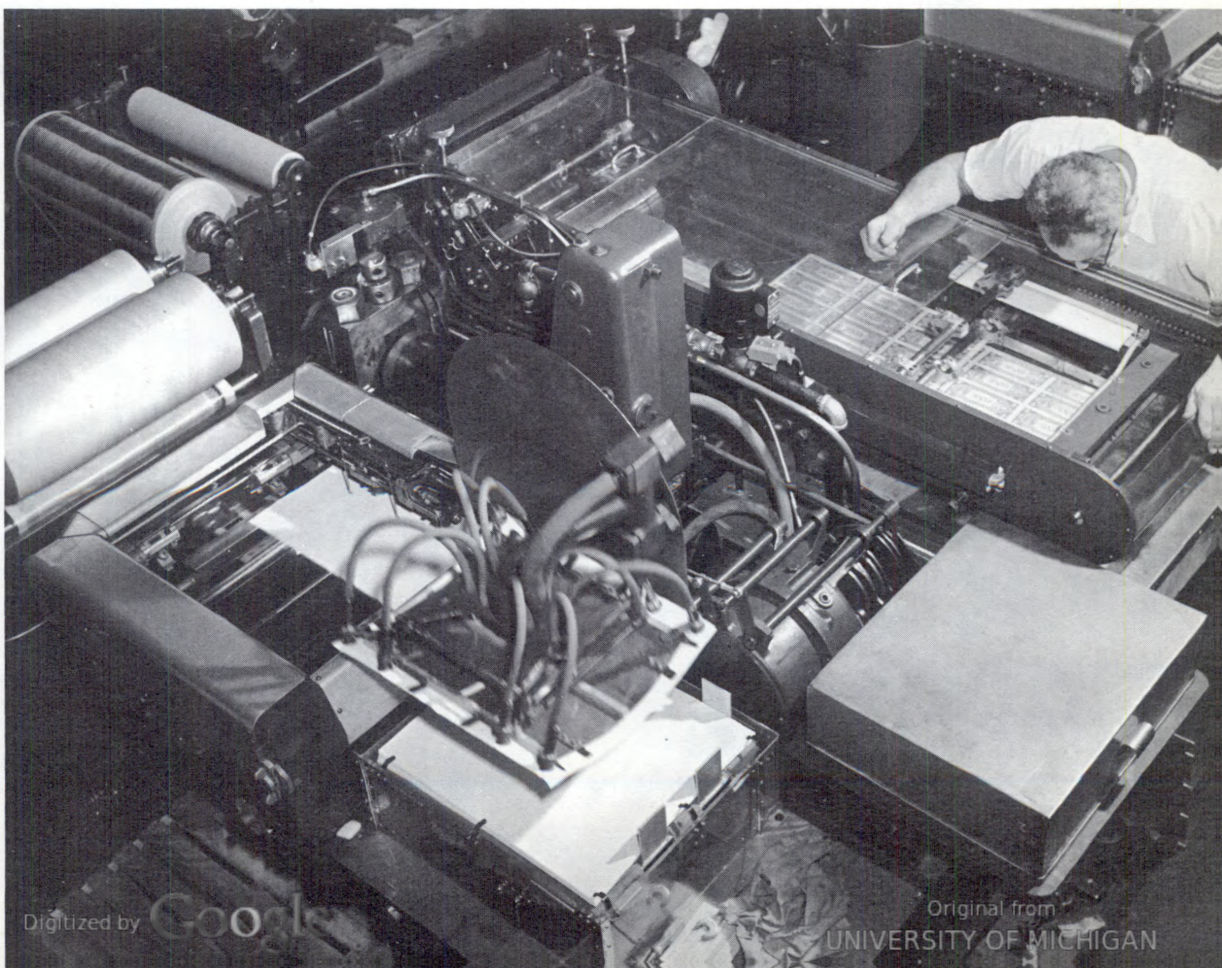
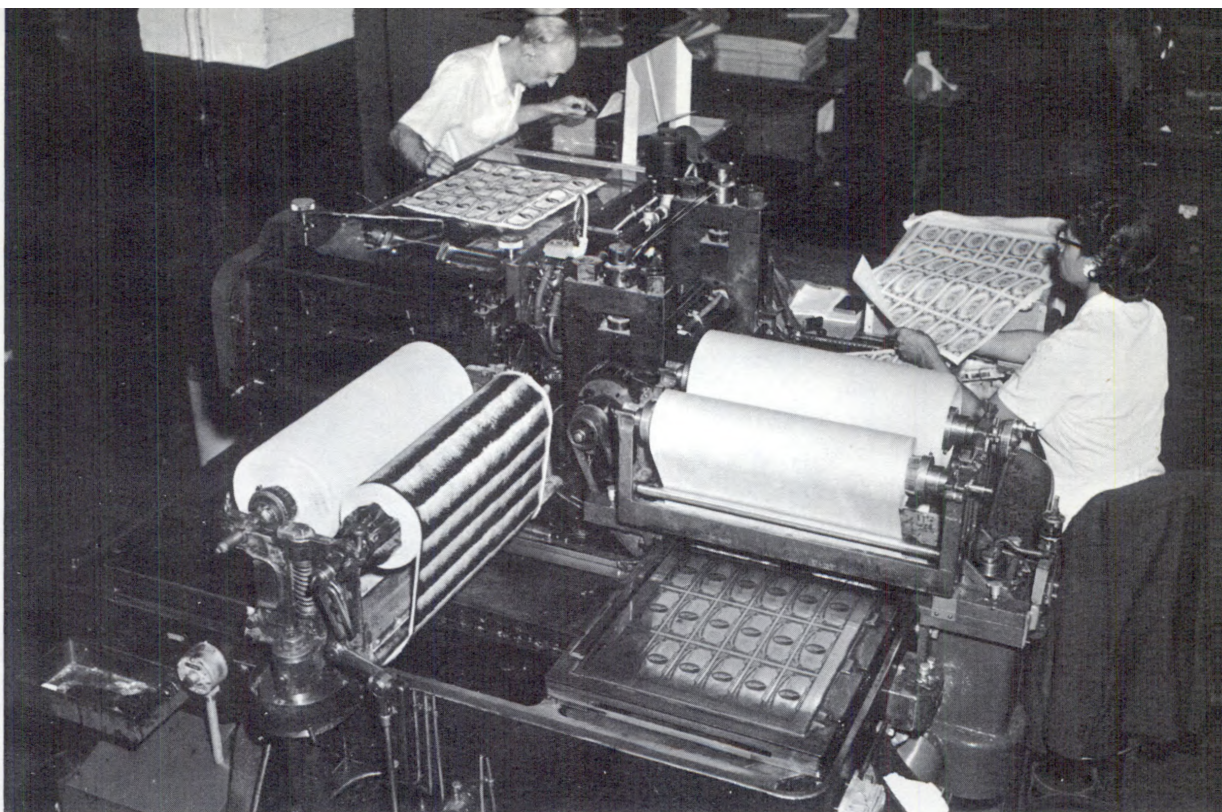
Flatbed Plate Printing Press Improvements

The hand press had been used in the Bureau since 1862. With but little modification, principally the addition of an electric motor, presses of this type were utilized for the printing of various issues of currency, bonds, and stamps on a diminishing basis until 1929, when they were discontinued as major production equipment.



Picture No. 1 shows a flatbed plate printing press prior to improvement. With installation of the automatic wiper (picture No. 2), the printer was no longer required to polish the plate by hand. The addition of the takeoff device (picture No. 3) eliminated the need for the services of one printer's assistant on each machine. The need for the other assistant was eliminated upon adoption of the feeder mechanism (picture No. 4), when the press was completely automated.





The steam press introduced in 1878 and the flatbed power press of 1898 incorporated the same principles as the hand-press, but performed the printing, inking, and wiping simultaneously through the continuous motorized movement of four platebeds around a square frame. The printer made the final polish by hand and an assistant placed the sheet on the moving plate, which was engraved with register markings for proper positioning of the paper. After the impression was printed by movement of the plate between a set of pressure rollers, a second assistant removed the sheet and the plate continued to another cycle.

In 1949, the Bureau developed a polisher mechanism which did away with the need for hand polishing. At the time that these mechanisms were being added to presses, semiautomatic feedboards were also installed on the machines. These feedboards made it unnecessary for the assistant to place the sheet directly upon the plate; two holes were drilled into the side margins of the paper and the printer's assistant placed the sheet onto two pins attached to a feedboard mechanism which automatically registered the sheet in the proper position for printing. Because of these two changes, motor speeds could be so increased that individual press production rose by 30 percent.

Sheets continued to be removed from the press by hand. However, with the development of the nonoffset green ink it was clear that an automatic takeoff and delivery device was not only feasible for the purpose but necessary for realization of the full benefits of the new ink. At the time of the trial runs conducted in 1943 with the originally developed nonoffset

ink, it was determined that the best results could be attained only if it was possible to standardize the removal of the sheets from the press. This could best be accomplished by mechanical means, since the handling of the sheets by many different people was too variant a factor. For instance, though the ink would not offset it could be smudged. Also, an assistant merely in taking sheets off the press one by one and placing them in the tray would be fanning the work to a certain extent and there would be a resultant loss of moisture content. As a consequence, automatic delivery devices, constructed in accordance with a basic design developed by the Bureau, were installed in the latter part of 1951 on all presses engaged in printing currency backs. The design called for a group of small suction cups set in a revolving vacuum cylinder. The printed sheets were individually picked up by the cups, transferred to a gripper on an endless chain, and then deposited in a sheet-stacking apparatus. All this mechanism was encased in a plastic compartment to aid in conservation of the moisture in the sheets. Upon the successful development of a nonoffset black ink, it was possible to extend the use of automatic takeoff and delivery devices to the presses used in production of faces of currency and savings bonds.

On the basis of a considerable amount of previous engineering research, the development of a fully automatic feeder was integrated with the 18-subject conversion program. Based on successful performance of pilot-model equipment, production units were purchased and installed on the currency presses during 1953 and 1954. The automatic feeder picked up

single sheets of wet paper from a stack and delivered them to a feedboard, where they were positioned by eight grippers and registered in relation to the plate. As the plate moved forward, the sheet was carried by two vacuum bars to the revolving impression cylinder. Automatic feeders and delivery devices obviated the need for the two assistants on each flatbed press.

As early as 1938 experiments had been conducted in printing currency on paper received in a wet state from the manufacturer. It was evident that paper furnished in this condition would be more nearly uniform and would eliminate numerous technical problems associated with the wetting of the paper in the Bureau. The installation of automatic feeders on the currency presses provided the impetus for further research and development work on mill-wet paper. As a consequence, new methods of wrapping, handling, and transporting this type paper were perfected with the active and constant collaboration of the paper manufacturer. At the same time improved fungicidal and germicidal components were found advantageous and incorporated in the product. Meanwhile, tests were being conducted with the new paper under actual pressroom conditions, and with each improvement progressively larger amounts were used in the regular course of printing currency. Finally, by September 1954, all currency was being produced with mill-wet paper. The machines used for wetting the paper in the Bureau, which had been hailed so enthusiastically at the time of their introduction in 1911, were stilled.

All these changes had occurred in a period of less than 5 years. The benefits

resulting from this phase of the modernization program were multiple. In cold statistics, they can be summarized in a total recurring savings of approximately \$5½ million annually and an increased productive press output of 100 percent. On the human side, they represented many hours of seemingly endless effort—even frustration at times, but throughout it all there was a feeling of accomplishment and pride. The stage was set for the inauguration of the second phase.

New Designs for Federal Reserve Notes

In July 1950, an acute shortage in the Bureau stocks of Federal Reserve notes was caused by increased demands for this class of currency. The Bureau's workload was already at peak production status because of the overwhelming needs for silver certificates. To make matters worse, the Korean conflict had begun and there was a possibility that some 30 plate printers would be called into active duty in the armed services by reason of their membership in the National Guard or Reserve units. Overtime was necessary and the plate printers agreed to increase their individual productive output by 2.7 percent in order to help relieve the situation.

Meanwhile, the Bureau's planning staff was busy in developing a remedy; namely, the overprinting of signatures, series, and the identifying seal on the face of the notes for each Federal Reserve bank. This method of overprinting certain features on currency had proven a successful economy and production measure in the pro-

duction of \$1 silver certificates. Twelve years had elapsed since 1938 when the series year, the last item considered for overprinting on the \$1 notes, had been deleted from the engraved plates. At that time there were such an extremely large number of plates for other currency issues in the vault that it was not considered economically feasible to adapt the overprinting method to these issues. The change-over would involve a revision in the design of the notes, and new plates would have to be made. The inventory value of the plates for the other denominations was too great to warrant their replacement at that time. The impact of World War II, with its pressing need for metals directly connected with the military effort, and the readjustment years following the cessation of hostilities further delayed expansion of the overprinting method to other denominations and classes of notes. The increased demand for Federal Reserve notes in 1950, however, gave impetus to applying the method to that class of currency. Past experience had proven that certain portions of currency notes could be overprinted without adversely affecting their security protection. It was known that if the specific identifying features on the Federal Reserve currency could be overprinted, improved scheduling would result, deliveries would be more timely, and there would be less complication in maintaining sufficient stocks. A specific example of the economies that would result was demonstrated in the previous year when a new Treasurer of the United States was appointed and it became necessary to alter or replace 900 plates, all because the facsimile signature of the

former Treasurer appeared as part of the engraved work. The charge for making the required change in Federal Reserve plates amounted to \$160,000. In proposing to overprint Federal Reserve currency, the Bureau pointed out that, in view of the fact that the identification symbol of each of the 12 Federal Reserve banks was then engraved in the plates for the respective banks and there were 9 denominations of Federal Reserve currency, it was necessary to maintain 108 separate combinations of printed stock in order to meet production demands. It was further noted that, if the Bureau was permitted to include the identification symbol in the overprinting operation, it would be necessary to maintain only nine denominations of stock.

The Board of Governors of the Federal Reserve System seriously considered the Bureau's recommendations and agreed to the use of the overprinting method for printing the signatures of the Secretary of the Treasury and the Treasurer of the United States along with the series designation and the bank identification symbols. In order to include these items with the printing of the serial number and the Treasury seal, which were already being overprinted, it was necessary to redesign the numbering presses so that all the features could be overprinted in one operation. The Secretary of the Treasury approved the change in August 1950. The first notes bearing the new overprinting—\$5, \$10, and \$20 denominations for the Federal Reserve Bank of Richmond—were delivered on November 3, 1950. The notes were distributed in the Washington, D.C., area first so that public reaction

could be observed firsthand. Since there was no adverse comment, the plan was carried through to completion and notes for the other banks were distributed soon thereafter.

Business-Type Budget

At the request of the Director, a survey of the fiscal activities of the Bureau was undertaken in April 1949 by representatives of the Treasury Department; the General Accounting Office, and the Bureau of the Budget, in cooperation with the Chief Accountant of the Bureau. The purpose of this survey, in keeping with Government policy, was to determine the most satisfactory budgeting, accounting, and financing procedures to serve the Bureau's industrial-type operations and the best method of financing such operations. At that time, approximately two-thirds of the work produced was financed by annual appropriations made by Congress directly to the Bureau, while one-third was financed through reimbursement from customer agencies. The items manufactured under direct appropriation included U.S. currency, internal revenue stamps, disbursing officers' checks, and a wide variety of miscellaneous commissions, certificates, and other documents. Requisitioning agencies, on the other hand, made payment to the Bureau for Federal Reserve notes; U.S. postage stamps; savings bonds and stamps; Treasury bonds, bills, and notes; and additional classes of products not included in the direct appropriation.

As a result of the survey, it was recommended that, in view of its industrial-type operation, the Bureau should develop

a fiscal program analogous to that of commercial firms. Accordingly, a legislative proposal was submitted to Congress to effect changes in the accounting, budgetary, and financing systems of the Bureau, and this resulted in the enactment of Public Law 656 of August 4, 1950 (64 Stat. 408). The law, which became effective July 1, 1951, requires all customer agencies to pay the Bureau at prices adequate for it to recover the amount of all direct and indirect costs, including administrative expenses associated with performing the work. Instead of receiving yearly congressional appropriations, the Bureau was advanced working capital of \$3,250,000 which is used to meet such items as payrolls and purchases of raw materials until such time as the products can be completed and payment received from the requisitioning agencies.

Many advantages have accrued from this program. More meaningful cost and financial statements are developed so that better analyses can be made of operations. It eliminates the need for the Bureau to justify appropriation requests for printing requirements of agencies over which it has no control. With funds recovered through the depreciation of equipment, a practice permitted under the new system, the Bureau can better plan and schedule extended technological improvement programs and purchases of specialized equipment. Although annual appropriations are no longer requested, the Director appears each year before representatives of the Treasury Department, the Bureau of the Budget, and the Congress to give an accounting of his stewardship of the Bureau's funds.

Payment for Lost Sheets

For many years, Bureau employees were required to pay face value for losses that occurred during the manufacture of securities, even though the securities were incomplete. When a shortage could be traced to a particular employee, that person was held individually responsible. If the shortage could not be traced to a specific person or group, all the employees in the section or division in which the discrepancy occurred were assessed for the amount of the loss.

In his 1864 report to the Secretary of the Treasury, Spencer M. Clark indicated that this policy was in effect as early as that time. In 1875, George B. McCartee reported that during the 6 years he had served as Chief of the Bureau, "there have been but three instances of discrepancy, whether from theft, embezzlement, or otherwise; and in each of these the discovery has been prompt, and the reimbursement of the Government effectual." He further reported that since two of these losses, amounting to \$830, were not chargeable to any particular individual or group of persons, they were paid for by the "Chief of the Bureau and his assistants."

The rules and regulations of the Bureau which were approved by the Secretary and published on November 1, 1880, contained the following statement:

The employes of each division will be held responsible by the superintendent of the division for work while in their custody. And when sheets or parts of sheets representing values, or designed to represent values, shall be lost in any division, the employes in such division will be assessed to the full amount of such dis-

crepancy, and may also be subject to rigid examination in the endeavor to discover such mislaid or lost sheets or parts of sheets representing values.

Whenever a shortage was discovered, a "pay receipt" covering the face value of the missing item was obtained from the responsible person or the superintendent of the division involved. The "pay receipt" authorized the Bureau's disbursing officer to withhold from the employee's salary an amount equal to the shortage, provided the missing item had not been located or the shortage had not been otherwise adjusted within a period of 30 days. Eventually the signing of the "pay receipt" became somewhat of a formality, since it was customary to accept contributions from employees of the division concerned to compensate for the loss. The needed amount was collected by "passing the hat"; groups of workers voluntarily assisted in making up the shortage as a personal matter among themselves in order that no one employee would be required to bear the full amount. No record was maintained of the amount specific individuals contributed. The moneys so received were deposited with the Treasurer of the United States as miscellaneous Government receipts. If a missing sheet or item was afterward located, a refund could not be made since withdrawals from this account were allowable only through special congressional authorization.

On May 25, 1925, the Secretary of the Treasury approved a procedure which resulted in the creation of a fund known as Special Deposit Account No. 29. Moneys collected from Bureau personnel were held in this account so that

the Government could be reimbursed in the event securities lost during the course of manufacture were put into circulation irregularly, or refunds could be made to the employees in case the missing items were found. The first deposit in the amount of 10 cents was made on September 17, 1925. In its 26 years of operation, the special account received about \$10,700. Approximately \$135 was returned to employees and \$1,465 was withdrawn by the Government for securities irregularly issued. During this same period some \$2½ trillion in various securities were printed by the Bureau—a statistic that demonstrates remarkable honesty and efficiency on the part of Bureau employees.

In 1950, in the light of changed management-labor relationship not only in Government but in private industry as well, the Bureau undertook a thorough study of the policies and practices relating to compensation for security shortages. In response to a request for his opinion, the General Counsel of the Treasury advised the Director of the Bureau that (1) the Government is not obligated to redeem incompleting paper which has been placed in circulation by a wrongdoer and, therefore, there appeared to be no justification for collections made from employees of the Bureau to cover losses of such incompleting securities; (2) Federal laws contain authority to protect the United States from fraud and loss in the preparation and issue of securities, therefore assessment against an individual responsible for loss of completed securities would be permissible; and (3) it was improper to solicit contributions to make restitution for losses.

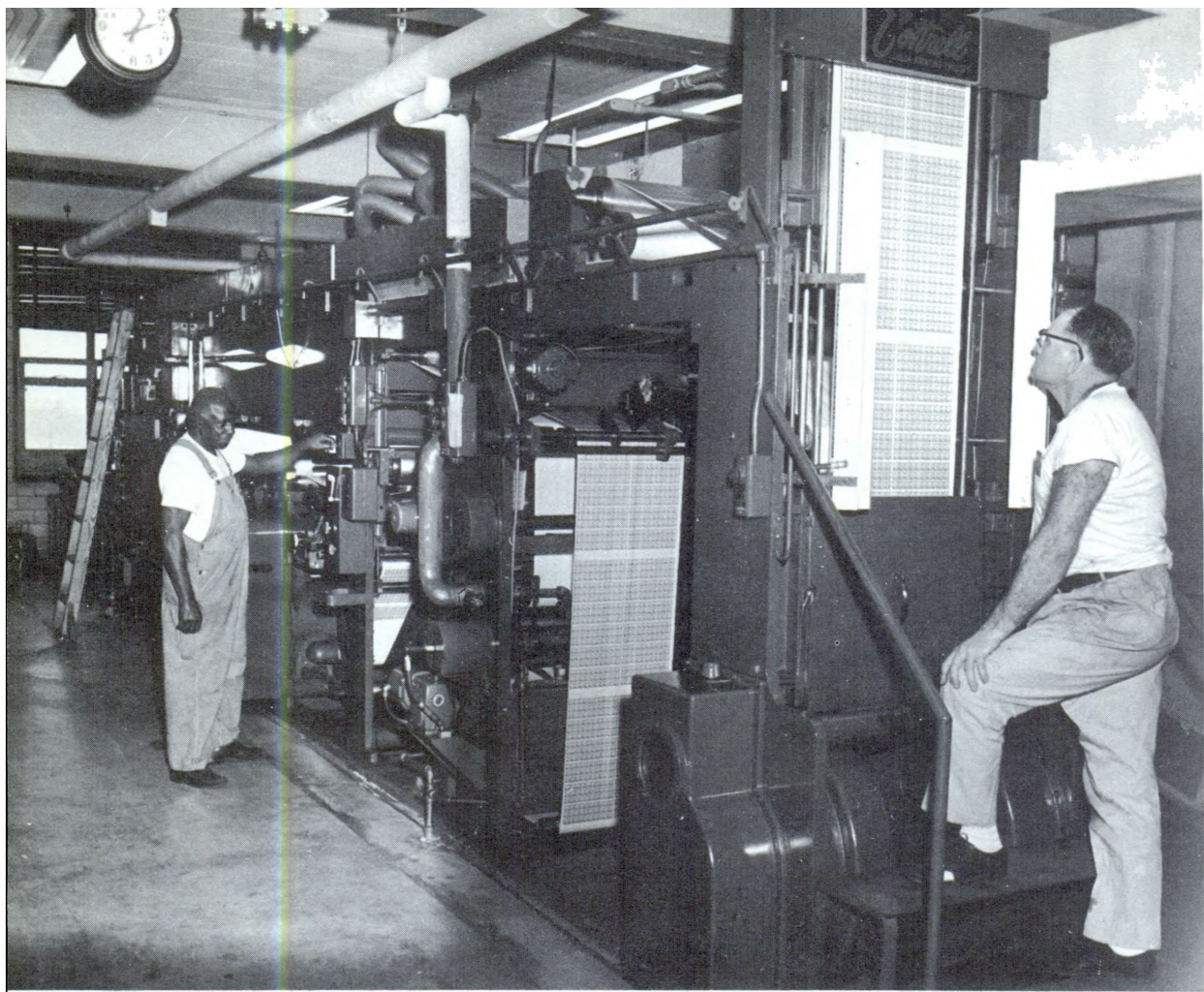
On October 19, 1951, the Director issued a bulletin establishing a policy which remains in effect today. It provides that when individual responsibility for loss can be fixed, the person involved will be required to make reimbursement for securities which the Government is called upon to redeem. In other cases of shortage, disciplinary action will be taken and the practice of soliciting contributions from employees was discontinued.

The balance in Special Deposit Account No. 29 was transferred as miscellaneous receipts to the general fund of the Treasury in July 1954 and the account was closed.

High-Speed Stamp Presses

The original rotary web-fed intaglio press, commonly referred to as the Stickney press, had been introduced in the Bureau in 1914 and various improvements had been made to this equipment from time to time. Throughout the years, the growth of the national population and the continuing increase in the volume of the country's business created a demand for more and more postage stamps. The tremendous orders received during World War II years emphasized the need for new high-speed equipment to meet the ever-increasing requisitions for stamps.

In 1948 two Stickney presses were taken out of regular production and installed in the development laboratory. Here they were used as a basis for study leading toward the design and construction of new postage stamp press equipment. Through application of the data obtained from this study, specifications were prepared for a new high-speed web-fed in-



High-speed web-fed intaglio press (scanning mechanism end).

taglio press which was delivered to the Bureau in 1950. It was used for further experimentation and perfected to the point where it was suitable for printing bicolor stamps on dry paper in one continuous pass through the machine. It produced its first stamp in 1952—the 3-cent International Red Cross commemorative issue. The information furnished by the Bureau to the Post Office Department for use in preparing a news release relative to that stamp well describes this new press:

[It] is the result of more than ten years' research by the Bureau of Engraving and Printing looking toward the development

of a press which will provide a high-speed productive output of bi-color postage stamps, while still retaining the security feature provided through means of the . . . intaglio printing process. . . .

The press is equipped with electronic controls to insure accurate registration of the printed images, and has automatic temperature and constant tension controls. In addition, the latest safety devices for maximum protection to the printer, the installation of modern machinery for reduction of noise, vibration and excessive temperatures in the surrounding work areas, and a new and improved means of applying gum to the stamps have been incorporated into the design. The increased speed of the press made it necessary for the Bureau of En-

graving and Printing to develop quick-drying printing inks.

The news release went on to say that research work on this press would be continued in the interest of achieving maximum operational efficiency and economy. This further development work culminated in the purchase by the Bureau in 1955 of five electronically actuated web-fed presses of a similar, but improved, design. After some 40 years of service the Stickney presses were gradually retired from operation and scrapped.

The new equipment is much larger than the old Stickney presses, with speed and production approximately tripled. A multitude of improvements are incorporated in the machines, although the basic principles of their operation are essentially the same as those of the oldstyle presses. A few examples of the changes are:

A beta ray apparatus electronically measures and records the weight of the printed paper passing through the press before gumming, then measures and records the weight of the web after gumming. By referring to the difference between these figures, the plate printer can maintain the required standard film of gum on the back of the stamps.

An ingenious scanning device momentarily stops the movement of part of the web to permit the examination of the printed work while the press continues in operation.

Fast-drying heat-set inks are used. At the outset of the development project, it was obvious that high-speed rotary intaglio stamp printing would require an ink which dried instantaneously. As a result of intensive research, heat-set ink formulas were perfected by Bureau chemists for this purpose.

A typographic attachment for precanceling the stamps, when required, is equipped with electronic controls similar

to those on the electric-eye perforator. This provides for continuous automatic register adjustments of the overprinting.

The development of these presses came none too soon. Shortly after they were installed, the Bureau received the largest postage stamp order in its history—stamps needed for the change in the domestic first-class letter rate from 3 cents to 4 cents. At the completion of the initial order, the Postmaster General issued a press release on August 5, 1958, lauding the unprecedented accomplishment by the Bureau:

... when the increased postal rate bill became law [May 27, 1958] the Bureau's high-speed rotary stamp presses ... were placed in production on three shifts to print 4 cent book, sheet and coil stamps, as well as the new 7 and 5 cent air mail stamps for the Aug. 1 start of the new rates.

As an example of how well this was done, figures show that since the law was signed to meet the change over, the Bureau has turned out 6,237,004,794 stamps. This was far above normal production schedules.

The "Big" Robbery

New currency, tightly banded in 4,000-note bundles with steel strips, is sent to the packaging room to be wrapped in heavy kraft paper. Each wrapped bundle is affixed with a label describing the contents, including the serial numbers of the bills it contains. After being wrapped and labeled, the packages are piled on skids to be carted into the vaults where they are stored until requisitioned.

It was on the morning of January 4, 1954, the first workday of the new year, that two of these packages containing

\$160,000 in \$20 Federal Reserve notes were discovered to be missing. In their place were found two dummy packages made to simulate the genuine articles. Word of the shortage spread through the Bureau like wildfire. It soon reached the local newspapers and was picked up by the national press and wire services. John Q. Citizen and his family, who for the most part had little idea of where and how their paper money came into existence, listened that night to a radio broadcast or watched a television program that told the story of the big robbery at the Government's Bureau of Engraving and Printing. And as the news spread, so spread the long arm of the Department's criminal investigative unit, the U.S. Secret Service.

Shortages had developed in the Bureau's accounts in the past, but never before had they involved such a large amount of money—few cases had remained unsolved and in all instances the Government had been reimbursed for the missing amounts. Control over the actions of several thousand persons engaged in the production and processing of millions of dollars in securities each day is not an easy task. The problem was not new. It had been with the Bureau since its inception, as it was present in the private banknote industry at that time. Today, even with the most modern of protective systems, the best security factor rests with the personal integrity and honesty of each individual employee. Here lay the failure, discovered on that eventful day in early January 1954, that shattered an outstanding record of more than 90 years' duration.

A checker-distributor in the packaging

room conceived a plan for making off with two bundles of \$20 bills. At home, he cut up large quantities of ordinary paper into pieces the size of currency notes and packaged them in a form to simulate regular Bureau work. He tied the bundles together, placed them in a bag, and brought them into work on the morning of December 30, 1953. After entering the building, he approached the parcel booth, ostensibly to check his package in accordance with Bureau regulations which prohibited the taking of unexamined items into workrooms. As the guard at the door turned to examine the credentials of other employees, the checker-distributor slipped by the parcel booth and carried his package to a lockerroom on the third floor where, unnoticed, he concealed it under a burlap bag suspended in a large trash can. He then went to his own lockerroom, changed into his workclothes, and reported for work at the usual time.

His first assignment that morning was to assemble banded currency notes on a skid and deliver them to the wrapping machine. From previous experience he knew that it would take about 20 minutes for the operatives to wrap the quantity of notes he had delivered to them. He nonchalantly walked over to the skids of completely wrapped currency, picked up two packages, covered them with paper and carried them out of the room to a storage area in the attic. There he tore off the wrappers and steel bands and placed the money in two paperbags he had brought along with him. He concealed the bags under some rubbish and retained the parts of the wrappers to which the labels were attached. He was back on the first floor

before it was time to bring more work to the wrapping machine so that his absence went unnoticed. Later that morning, during the regular rest period, he returned to the third floor lockerroom, placed the labels under hot water to separate them from the kraft paper, then pasted them onto his false packages which he had removed from the trash can. He then covered the bundles with a piece of paper, took them to the packaging room, and placed them on the skid of finished work. The loaded skid was later removed to the vault. That afternoon, his tour of duty completed, he changed to street-clothes, went up to the attic, and retrieved one bag containing \$128,000. He left the remaining \$32,000 because he believed it would make the bag too bulky. Next, he crammed some old workclothes into the bag on top of the stolen bills and prepared to leave the building. On the way out he pulled a trouser leg from the bag to indicate to the guard that it contained soiled clothing. The usual security check was made in the operating section at the end of the day, but since all labeled packages were accounted for there was no cause for suspicion.

Finished packages are stored in the vault, according to numerical sequence, on shelves to facilitate their delivery in proper order. The skidload which included the two dummy packages was not needed for the next day's work and so it was not shelved. The succeeding day was a holiday, New Year's Day, followed by a weekend. On Monday the scales of fate slowly began to balance. Two vault attendants in shelving the work taken from the skidload stored in the vault noticed that two of the packages were

light in weight. They so informed their supervisor who opened the bundles and discovered the theft. But for the alertness of these two attendants the packages might have gone out of the Bureau and remained undetected for an indeterminate time, because new currency is generally retained unopened until needed by the recipient bank.

Immediately upon discovery of the theft, the Secret Service was notified and an exhaustive investigation was initiated. Interviews were begun of all employees who had worked in the processing section since the time the missing notes had been numbered. The next day, the Virginia State Police advised the Secret Service they had been notified that a large amount of the missing notes was concealed on a farm in Middleburg, Va. A solution to the case soon followed. The checker-distributor who had stolen the money was linked to the found notes and convicted of their theft. There were \$127,840 of the stolen notes recovered. An additional amount, slightly less than \$5,000, was recovered in small bills representing change received in passing some of the stolen \$20's. Restitution of approximately \$2,000 was made from the retirement funds and salary payments due the employee involved. In all, the loss to the Government through this case was approximately \$25,800.

Down through the years the Bureau has endeavored to maintain stringent control over its products. In 1864, reporting on the control system then in effect, Spencer M. Clark stated:

It is not supposed that this system is perfect. "Perfection is not among human conditions." But it has been improved

from time to time as experience has suggested, and it is expected to continue its improvement until it is as near perfect as "human conditions" will admit.

It seemed incredible that such an instance as the theft of \$160,000 by an employee could have occurred. Shocked by the happening, the Bureau immediately instituted additional product protection measures that would deter a recurrence. Once again, steps were taken to make the control system as near perfect as "human conditions will admit."

Sheet-Fed Dry Printing

As previously explained, the plate printing process entails the use of substantial pressure to force the paper down into the incised lines of the engraved plate. Wet paper, being more pliable, is easier to print than the dry. Dry printing, on the other hand, causes relatively little stretch and shrinkage in the paper, makes the use of larger size sheets feasible, and simplifies subsequent processing operations such as trimming and perforating.

Until 1952, all currency and postage stamps printed in the Bureau were produced by the wet method.¹ Today, approximately 50 percent of U.S. paper money and all our postage stamps are being produced by the dry method.

¹ Some of the early fractional currency issues were printed dry on hydrostatic presses, but the system was abandoned when the first Chief of the Bureau resigned in 1868. During World War I, some 1- and 3-cent ordinary postage stamps were produced by the offset printing method; and for a short while in 1920, the 2-cent ordinary postage stamp was produced in the same manner.

The full development of dry printing in the Bureau spans a period of some 25 years. Step by step, the program progressed through trial and error. It would be untruthful to say that there were not momentary periods of doubt as to the wisdom of the course being followed or as to the final outcome. Likewise, there were temporary setbacks. Sometimes success was achieved in mere steps—at other times, in broad strides. Knowledge acquired at one stage was applied and then used as a steppingstone toward the final goal. This is the story of those 25 years.

In 1934, experiments were conducted to adapt the flatbed engraved plate press to the printing of dry paper, but the tests were discontinued when it was determined that many radical changes in machine structure as well as in the materials used in the printing would be necessary. As a consequence of the potentials demonstrated through these experiments, in 1939 the Bureau ordered a flatbed press which was essentially the same as those then in productive use, but the new machine was built to withstand greater pressures. Some dry printing was done on this press, but the development work was curtailed to a great extent because of wartime conditions.

In 1953, the Bureau obtained a sheet-fed rotary press that employed the dry-method principle. This press was patterned after a machine utilized by the British-American Bank Note Co., Ltd. of Ottawa, Canada, and was based on drawings and designs graciously furnished by that firm to the Bureau. Even at the time of manufacture, however, it was recognized that this equipment did not embody all the modern engineering ad-

vancements that had then been developed in printing press equipment. Nevertheless, it was a tool for use as a starting point and was to prove of inestimable value to the Bureau. It was employed mainly for the purpose of developing and improving inks, methods, and materials. Its use led toward the realization of the more complex and efficient dry printing presses that were to be forthcoming in the Bureau.

A report on the progress made with this experimental press is recorded in a news release put out by the Post Office Department at the time of the issuance of the new 8-cent ordinary postage stamp in 1954. This new stamp was printed in bicolor in two passes through the press. It portrayed the Statue of Liberty, in three-quarter length, with the wording "In God We Trust" forming an arch over the head of the statue. These features were printed in red. The frame, or background, which defined the outline of the stamp was printed in blue in a gradual tone effect, dark at the edges, and fading toward the center to create a radiant burst of white at the back of the figure. The informational release stated in part:

It [the 8-cent stamp] is being produced by the dry intaglio method rather than the wet method and is being printed on pre-gummed paper.

For some time the Bureau of Engraving and Printing has been conducting experiments, exploring the feasibility of dry intaglio printing of securities. These experiments have progressed to the extent that the method is deemed practical for the printing of postal items. Since registration tolerances of the [various features of the] new "Liberty" design are so critical, and because of the variation in expansion

and contraction associated with printing on a moistened paper, it was felt that the dry method was especially appropriate for the production of this particular stamp.

The printing is being accomplished [in part] on equipment previously procured for experimental purposes. The ink used is a special Bureau developed product having quick drying qualities.

Much was learned through the use of the press under actual production conditions. For example, there were frequent mechanical breakdowns, partly attributable to the excess pressure requirements—this showed a need for stronger press parts. The tremendous pressure tended to stretch the paper—this would have a bearing in the manufacture of press plates in the future. The completed sheets showed a slightly pinkish hue—an indication that the adjustments of the wipers required further refinements since they failed to remove all the red ink from the plate. The residual color effect was also evidence that some of the ingredients of the red ink had characteristics which made the wiping of the plate more difficult than when inks of other colors were used. A second press of the same design was procured in 1954 for the purpose of expanding the development program on sheet-fed rotary intaglio printing equipment.

Meanwhile, Bureau technicians were considering the use of the press for the dry printing of currency. Also, in this connection, a joint effort was undertaken with the distinctive paper manufacturer to perfect a paper that would be best suited for the dry method. It was found that by adding a resinous component to the paper during manufacture, it was possible to increase the paper's tensile

strength and folding properties.² However, employment of this additive necessitated a further search for a suitable plasticizer to make the paper sufficiently pliable for intaglio printing. At the same time, it was necessary to determine the ideal amount of plasticizer to be added in proportion to the quantity of resin component used.

Marked success was attained through all these efforts, and in the latter part of 1954 specifications, based on accumulated findings, were prepared for a new sheet-fed rotary press embodying the dry principle. Comments on these requisites were sought from seven well-known manufacturers of printing press equipment. The letter of request sent to each of these firms stated, in part:

The primary purpose of this equipment is to meet future production requirements for United States currency. Further objectives are to increase efficiency and economy of operations and to improve the quality and security of the printed product. In order to meet the production requirements with available manpower it has been determined that new presses will be required. Our surveys indicate that an urgent need for this equipment will develop and, consequently, time will be of the essence in an award of contract.

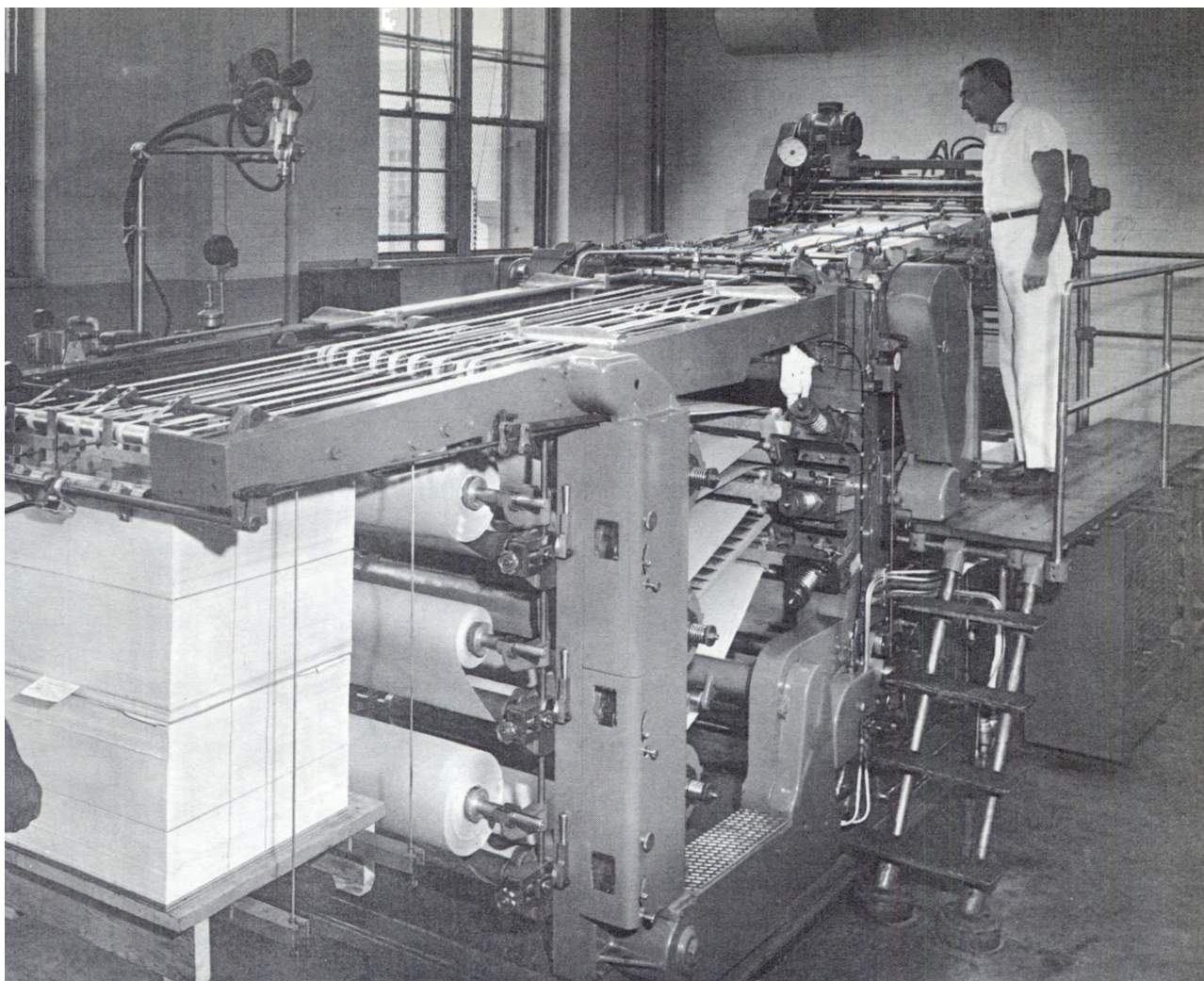
As a result, two of the companies which felt that they had equipment suitable for the Bureau's needs offered their machines for evaluation. The tests of both presses were begun early in 1955. In each case, the equipment was furnished at no obligation or cost to the Government, except for transporting the presses to the Bureau.

² Study is currently in progress to overcome certain technical difficulties associated with the use of paper of similar composition in the wet printing method.

The firms supplied their own engineers, machinists, and printers to set up and operate the machinery and acquaint Bureau personnel with the equipment. The presses were installed in adjacent rooms, securely locked from one another and from all unauthorized persons. The technicians labored industriously for more than a year to furnish a product that would meet the exacting standards of the Bureau. In October 1956, one of the manufacturers submitted several sample sheets of currency produced on its press. A special committee of Bureau officials appointed for the purpose carefully examined the sample sheets and determined that they were of an acceptable quality. In January 1957, following further large-scale tests of the satisfactory press, the Bureau proceeded with plans for the procurement of eight presses of similar design. The experimental press used in the evaluation studies was also purchased.

A much-simplified explanation of these presses, touching on only the fundamental points of their operation, follows.

Basically, the press consists of a plate cylinder positioned directly beneath an impression cylinder. The printing plate, which is made of nickel and chromed, is fitted to its cylinder and clamped. As the plate revolves it is automatically inked, wiped, and polished. There is a row of grippers recessed into the impression cylinder. The press is equipped with an automatic feeder which holds 10,000 sheets of paper and delivers each sheet individually to a point where it is positioned into the jaws of the impression grippers. These hold the paper fast, and as the cylinder revolves it carries the paper to the point where one end of the sheet comes in con-



Sheet-fed rotary intaglio press for dry printing.

tact with the companion end of the printing plate. As the two cylinders continue to revolve, the whole sheet is printed. Then the tension grippers relax and the sheet is automatically removed from the impression cylinder, carried on endless tapes, and neatly stacked at the delivery end of the press.

The printing process involves the use of dry, distinctive paper, specially formulated nonoffset inks, and an engraved electrolytic 32-subject plate.

The use of the larger sized plate effected certain changes in plate manufacturing operations in the Bureau. Dies and plates required for the wet printing method were

always made slightly larger than the completed notes to compensate for shrinkage in the paper as it dried. Since no shrinkage occurs in dry printing, it became necessary to reduce the plate size to exactly that of the printed note in order to retain the original dimensions. To make this reduction ($\frac{1}{4}$ inch in length, $\frac{1}{8}$ inch in width) the principal portions of the original design were taken up on rolls and transferred precisely within limits of the smaller size onto a new die; the linkage between the various elements was made by meticulous hand engraving. From the new die, eight altos were manufactured by the electrolytic process and joined ver-

tically after they had been properly machined and matched. An eight-subject basso was thus prepared, which, in turn, was used to make four more altos. These were joined side by side to form the 32-subject alto from which the printing plates were produced. The 1957 series of \$1 silver certificates was the first currency printed in its entirety from plates made solely by the electrolytic process. The design of these notes embodied the inscription "In God We Trust" for the first time on any U.S. paper money.

A sheet-fed rotary press prints approximately 2,400 impressions an hour, as compared with 900 impressions an hour on a flatbed press. The work is printed in lots of 10,000 sheets. The backs are produced first and held intact for approximately 24 hours to permit the ink to dry. They are then faced on another press. After the face printing, the work is kept in the printing area overnight to allow the black ink to dry. The next day the sheets are delivered to the examining area and thus continue on their way to become finished currency notes.

The entire operation of sheet-fed rotary printing of 32-subject dry currency, as well as the subsequent processing of the work, is unique in that all the functions are performed in a self-contained area. This assembly-line production of paper currency has simplified operations and enhanced security protection.

"In God We Trust"

The inscription "In God We Trust" has been used on U.S. coins intermittently since 1864. It also appeared on the 3-cent and 8-cent ordinary postage stamps

introduced in 1954. However, it was not incorporated as a prime feature in the design of a currency note until 1957. It had appeared incidentally in four previous instances. The contract made in 1863 with the American Bank Note Co. for notes of the original series of national bank currency specified that the back designs include a reproduction of "the coat of the State from which the note is to be issued." Since the Florida seal included the wording "In God We Trust," notes prepared for banks in that State consequently bore the motto. The seals of the various States were also used on national bank notes of series 1875 and 1882. The backs of the \$5 silver certificates, series 1886, depict five silver dollars. Portions of the inscription "In God We Trust" are discernible on four of the coins so pictured.

An amusing Lincoln remark relative to the advisability of putting the motto on greenbacks is reported in Ward Hill Lamon's *Recollections of Abraham Lincoln, 1847-1865*. When asked for his view in the matter, the President replied, "if you are going to put a motto on the greenbacks I would suggest that of Peter and John: 'Silver and gold we have not, but what we have we'll give you.'"

On January 5, 1955, the Honorable Charles Bennett, Member of the House of Representatives from Florida, introduced a bill providing that all U.S. currency issued more than 6 months after enactment should bear the inscription "In God We Trust." In answer to a request from the Office of the Secretary of the Treasury for comment on the proposal, the Director of the Bureau stated that if the Department was so disposed, the inscription could be incorporated into the

design of currency notes in connection with the introduction of new presses suitable for the production of larger size sheets of currency then being contemplated.

Actually, specific legislation is not required for a change in the design of currency, since the Secretary of the Treasury is empowered by law to issue paper money in such form as he deems suitable. Acting upon this authority and with the personal approval of President Dwight D. Eisenhower, the Secretary decided that rather than wait for the passage of specific legislation, arrangements should be made to incorporate the inscription into currency designs in conjunction with the adoption of the new printing equipment.

In May 1955 the Department advised the chairman of the House Committee on Banking and Currency, which had Mr. Bennett's bill under consideration, of this decision. At the same time it was pointed out that if the time element as originally specified in the bill were allowed to stand, it "would create administrative difficulties as well as a very substantial additional cost." As an alternative the Department proposed that the bill be amended to read as follows:

That at such time as new dies for the printing of currency are adopted in connection with the current program of the Treasury Department to increase the capacity of presses utilized by the Bureau of Engraving and Printing, the dies shall bear, at such place or places thereon as the Secretary of the Treasury may determine to be appropriate, the inscription "In God We Trust."

The substitution was agreeable to Congressman Bennett with the addition of a final clause, "and thereafter this inscription shall appear on all United States cur-

rency and coins." The bill was amended accordingly, passed unanimously by the House and Senate, on June 7 and June 29, respectively, and approved by the President on July 11, 1955 (69 Stat. 290).

Meanwhile, the Bureau had begun evaluation of the two types of presses for printing currency in 32-subject sheets by the dry intaglio process. At the same time, arrangements were underway to prepare new dies and plates for \$1 silver certificates bearing the inscription for use on the new equipment. The Bureau deemed it practicable to plan for the installation of the new machines on a gradual basis. With this in mind, the Bureau felt it could best comply with the spirit and intent of the congressional act by devoting the new equipment exclusively to the printing of \$1 notes, since this denomination represents over 50 percent of the total volume of all paper money now produced. Production on the new presses got underway early in July 1957. The Bureau made the first delivery of notes bearing the inscription on September 9, 1957, for placement in circulation on October 1.

The output of these new machines was not sufficient to meet the demands for \$1 notes and some bills of this denomination continued to be produced on the old presses. This simultaneous production from the two varieties of plates accounted for the fact that some new \$1 notes without the inscription were placed in circulation. The situation gave rise to a misconception on the part of a great number of persons throughout the Nation. Prompted by newspaper, radio, and television accounts that were misunderstood, or by statements that the missing inscrip-

tion from some new notes was tied in with atheistic intent, these people wrote to the White House, the Treasury Department, and the Bureau about the matter. More than a thousand complaints have been received, many of them multiple-signed petitions and resolutions of protest by religious, civic, and veterans' organizations.

Beginning with September 15, 1961, all \$1 notes have been printed with "In God We Trust."

Job Security

With the introduction of the technological improvement program, which not only improved many processes but also resulted in substantial increases in productive output, it was inevitable that there would be a surplus of employees in the Bureau. Many persons hired because of the exigencies of World War II were still on the rolls. As the improvement program progressed, it became necessary to resort to reductions in force. Every effort was made to lessen the impact of the employment situation. Nevertheless, many employees became apprehensive for their jobs because of the layoffs and the esprit de corps for which the Bureau was so well known was adversely affected. Understandably, some employees were not enthusiastic about the installation of further improvements that might result in their loss of employment. Recognizing the situation, in 1957 the Bureau initiated a policy that can well be regarded as unique in Government operations. Those improvements deemed essential to economical operation having already been in-

stalled,⁸ it was decided that any further refinements would be geared to manpower availability. All employees, regardless of job classification, were assured that no one would be involuntarily separated from the service except for cause.

This job security policy remains in effect today and involves several guidelines. These are: (1) continuing research is performed with a view toward improvement of machinery and systems; (2) installation of such machines and systems is geared to normal attrition of regular employees; and (3) outside recruitment is kept to an essential minimum. This last factor has been accomplished through the detailing of qualified personnel from regular work assignments to other assignments as the work programs fluctuate, training in new skills, reengineering of jobs for increased efficiency and better utilization, and the assignment of overtime work on a temporary basis as required by the various work situations.

The success of the job security policy was well expressed in the statement made by the Director before a House of Representatives Appropriations subcommittee on March 6, 1961, when he said:

In pursuit of my policy of guaranteeing job assurance, these people [Bureau employees] have worked diligently and have brought about great increases in productivity. In the 32-subject note category, for example, there has been a 300 percent increase in unit productivity.

⁸The extent of the improvements already installed can be recognized through statistics showing that, notwithstanding a 45-percent increase in wages and a 25-percent rise in materials costs, it was possible to reduce the price of currency by approximately 8 percent in the period of 1951-61.

On our postage stamp presses, because of the enlightened attitude of management and labor, there has been a unit increase of 250 percent.

Accordingly we propose to continue these job assurances, and take full advantage of the fact that these people are turning out more work because they know they are not working themselves out of a job.

Multicolor Postage Stamps

Writing to the Acting Director of the Bureau in October 1900, the Third Assistant Postmaster General stated:

I desire to say to you in this personal way that I am especially gratified at the statement in your letter, that the stamps may be printed in two colors. I have all along believed that there is no reason why this government should not get out the best stamps under the sun.

Since the beginning of its printing U.S. postage stamps in 1894, the Bureau has spared no effort to produce "the best stamps under the sun." Ideally, postage stamps should be absolutely secure against counterfeiting and esthetically attractive as well. The engraved printing process is a method for approaching this end; the production of a stamp in more than one color is a further step in that direction. However, until the development of suitable printing equipment, stamps designed in multiple colors required the use of a different plate for each color and the individual colors had to be printed in separate operations.

The Post Office Department issued the first bicolor postage stamp in 1869. It was originally planned that the Trans-Mississippi-"Omaha" Exposition 1898 issue of postage stamps—the first set of

commemorative stamps printed by the Bureau—would be produced in bicolor. However, with the outbreak of the Spanish-American War in April 1898 and the subsequent heavy demands for the Bureau's service in the production of war revenue items, the idea was abandoned. Nevertheless, the issue was outstanding in its designs. The book, "Postage Stamp Design" published by the National Philatelic Museum, says of this series:

Deviating from stereotyped banknote design, the ornamental forms exemplified in the Trans-Mississippi issue of 1898 showed imaginative invention that made this issue one of the best designed series of its era.

The commemorative stamps issued in connection with the Pan-American Exposition held in Buffalo, N.Y., in 1901 were the first bicolor stamps produced in the Bureau. The six denominations comprising this series were printed with distinctive borders, each of a different color, and the vignettes, or central subjects, in black.

There were other two-color stamps printed, the 1918 24-cent airmail issue being probably the most well known. Its fame can be attributed to a quirk of fate. The stamp had as its central subject a mailplane in flight. Inadvertently, a sheet of these stamps was imprinted with the plane upside-down. The error went undetected through a number of examinations and it was only after the sheet of stamps was sold at a post office window that the purchaser realized that he had an oddity. The story of the high price at which the original buyer disposed of the item and the even higher amounts paid for it at subsequent resales was widely



The \$1 denomination of the Trans-Mississippi-“Omaha” commemorative issue is considered by many philatelists as the most beautiful U.S. postage stamp of the 19th century.

publicized and placed the issue in the celebrity class.

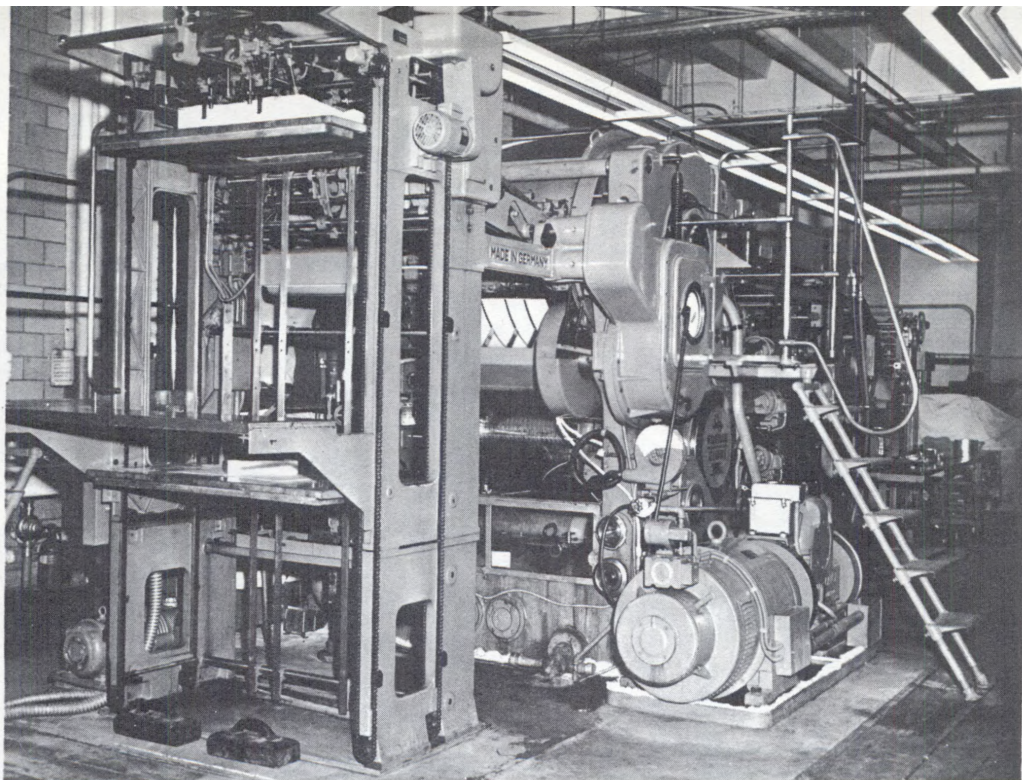
In the post-World War II years, marked by a tremendous advancement in the field of graphic arts, many countries issued varieties of multicolor stamps printed by typographic, lithographic, or gravure methods. Recognizing the growing interest in multicolor stamps, the Bureau intensively explored the potentialities of these processes for the printing of U.S. postage stamps. However, the resultant printed impressions were considered to be definitely inferior in quality to intaglio printed work. This factor, coupled with the knowledge that the equipment employed in the processes was readily available on the open market and thus could be easily secured by counterfeiters, impelled rejection of the use of the more common printing methods.

During the period of evaluation of the two intaglio sheet-fed rotary presses in 1955 and 1956 for the dry printing of currency, one of the machines showed extensive potentialities for multicolor printing.

Since there was a growing demand for more colorful postage stamps, at the conclusion of the currency tests late in 1956 it was decided to acquire this press for further experimentation in connection with the production of stamps. Initial expectations concerning this machine were soon justified and it was used to produce the 4-cent American Flag stamp issued on July 4, 1957. This was the first time that our flag had been reproduced in full color on a U.S. postage stamp, a step that was widely acclaimed.

The operation of this press differs from other plate printing presses in the Bureau in that a separate fountain and series of rollers are used for each color. The rubber rollers are cut out in such a manner that the different-colored inks are placed on the plate exactly where needed. The surplus ink is removed from the plates by a set of gelatin rollers which are cleaned as they revolve through a solvent bath. In this manner the plates are cleaned without the use of paper wipers. The combination of these features permits a multicolored impression with only one pass of the paper through the press and still retains the security aspect peculiar to the intaglio process.

Work is produced on the press in lots of 5,000 sheets. Pregummed paper is used. The paper is stacked in a feeder mechanism and as the printer starts the press, each sheet is separated from the pile by forced air, picked up by suction cups, and fed down the feedboard of the press where grippers on the impression cylinder carry it to the printing point. A pair of identical printing plates is secured to the plate cylinder. The rotating plates are successively inked by the inking-in



Multicolor high-speed sheet-fed rotary intaglio press.

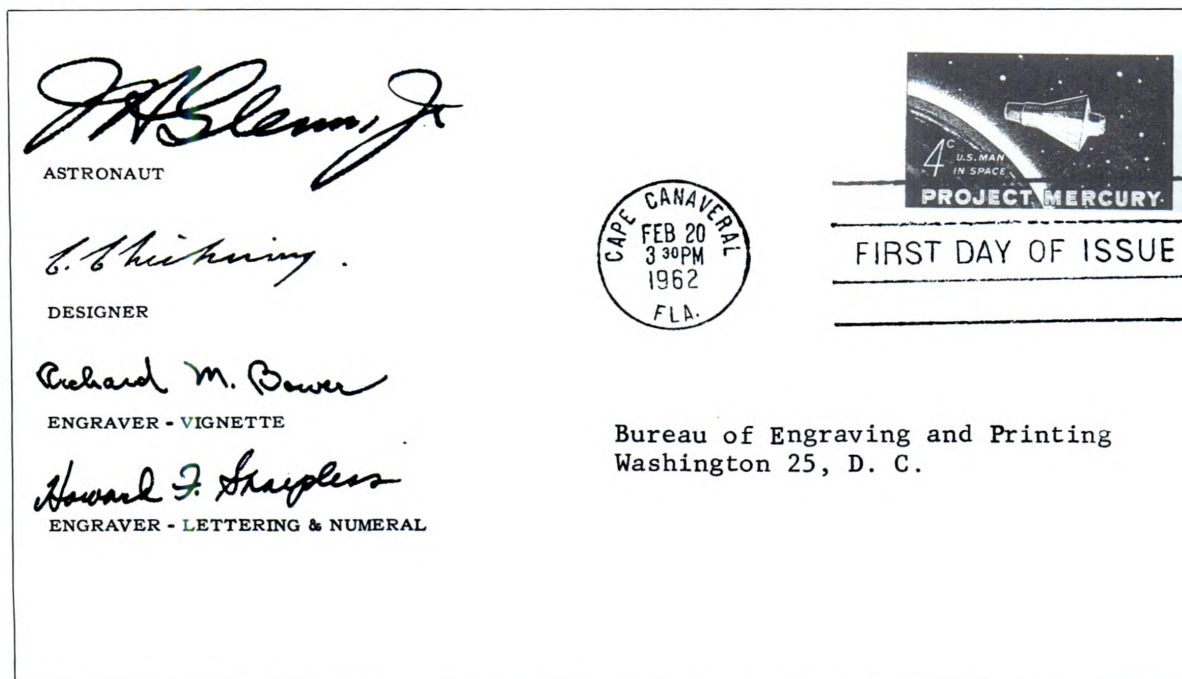
rollers, prewiped, wiped, and brought to the printing position. As the cylinders revolve, the impression cylinder presses the paper down into the incised lines of the engraving, producing an impression on the ungummed side of the paper. After the sheet is printed, it is automatically removed from the plate by another set of grippers on an endless chain and stacked in a pile. When completed, the 5,000-sheet unit is removed from the press and held intact until the ink is completely dry.

The various stamps produced on this press were so well received that the Bureau purchased another of these machines in 1959. The printers and technicians continued their experimentation and found it possible to cut the rubber rollers so that colors in certain areas could be blended—the inks actually become mixed in the recesses of the engraved plates as the press operates, thereby creating an-

other color or an intensified shading of one of the basic inks. The colors stay remarkably constant throughout long runs of the press. The Frederic Remington commemorative stamp, which was printed by this technique and issued in October 1961, was accorded a great deal of interested, complimentary comment from the public at large.

Project Mercury Stamp

Shortly after Astronaut Alan Shepard became America's first space pioneer, Post Office Department officials conceived the idea of a special postage stamp as a suitable tribute to this country's space exploration efforts. The proposal for issuing a commemorative stamp simultaneously with the completion of the first orbital flight by an American astronaut was worked out with officials of the National Aeronautics and Space Administra-



A first-day cover of the 4-cent Project Mercury commemorative postage stamp, specially autographed for this history.

tion and the Bureau. Because of the possibility that the flight might be unsuccessful, it was decided to withhold any advance notice relating to the stamp. The stamp was produced under strict security precautions.

The stamp was designated as the 4-cent Project Mercury commemorative issue. A log of the activities relating to the printing and processing of this item would read like a cloak-and-dagger drama. Normally, transactions between the Post Office Department and the Bureau are handled on the basis of formal written orders and receipts, but in this instance all instructions were given verbally and the proposed designs, models, and die proofs were transmitted by hand-to-hand operations. The Bureau's designer of the stamp

ostensibly took annual leave from his job; actually, he went into seclusion at his home studio to design the item. The engraver who did the lettering performed his work on weekends when no one else was in the shop. The picture engraver, supposedly on vacation, came in at night to engrave the central subject for the new stamp. The printing plates were made when the manufacturing division was supposedly closed. The multicolor pressroom was completely sealed off from the rest of the plant and declared "off limits" except for persons directly concerned.

When production of the stamps was completed, they were removed—over a weekend—to the packaging and shipping area. There they were stored in a newly finished vault. Unbeknown to a dozen

or so employees who worked in the area, the new storage space was already loaded to capacity with a "secret" stamp. On weekends the stamps were dispatched from the Bureau to the registry section of the Washington city post office for shipment throughout the country. Postal inspectors at 301 points across the Nation were alerted to receive unidentified sealed packages from Washington, to be kept unopened awaiting further instructions. Meanwhile, the Post Office Department had two philatelic canceling machines shipped from Detroit to the postmaster at Jacksonville, Fla., with instructions that they be held for postal equipment technicians. The Post Office Department ordered 1 million unmarked envelopes, ostensibly for headquarters' supplies, but in reality to be processed as "first-day covers"—souvenir day-of-issue cancellations marking the momentous achievement at Cape Canaveral. Project Mercury stamps were affixed to the envelopes by employees of the Department's Philatelic Section, working behind locked doors at night and over weekends. A large number of the stamped envelopes were transported to Cape Canaveral and the canceling machines were ordered to be delivered to a National Aeronautics and Space Administration official there. All was in readiness for issue of the new stamp.

At 3:30 p.m., February 20, 1962, the moment that Astronaut John Glenn was retrieved from the ocean and his flight pronounced a success, postal inspectors throughout the country were instructed to open the sealed cartons and release the contents for sale. Immediately, cancellation was begun of the first-day covers.

For the first time in American history, a stamp went on sale all over the Nation at the exact hour of the event it memorialized, with no advance "leak" that it was forthcoming.

Finis

It is appropriate that this history of the first 100 years of the Bureau of Engraving and Printing end with the telling of its part in the production of the "U.S. Man in Space" stamp. This stamp was issued to memorialize our country's efforts toward the increase of scientific knowledge and the maintenance of constant vigilance in the protection of the ideals on which the Nation was founded. These 100 years embody a constant effort to improve the Bureau's products and the methods, processes, and equipment used. These years cover a period of notable accomplishment in the printing of our Government's securities. The span embodies the gamut of all the experiences to which the human spirit is subjected—success and failure, pride and frustration, joy and sorrow.

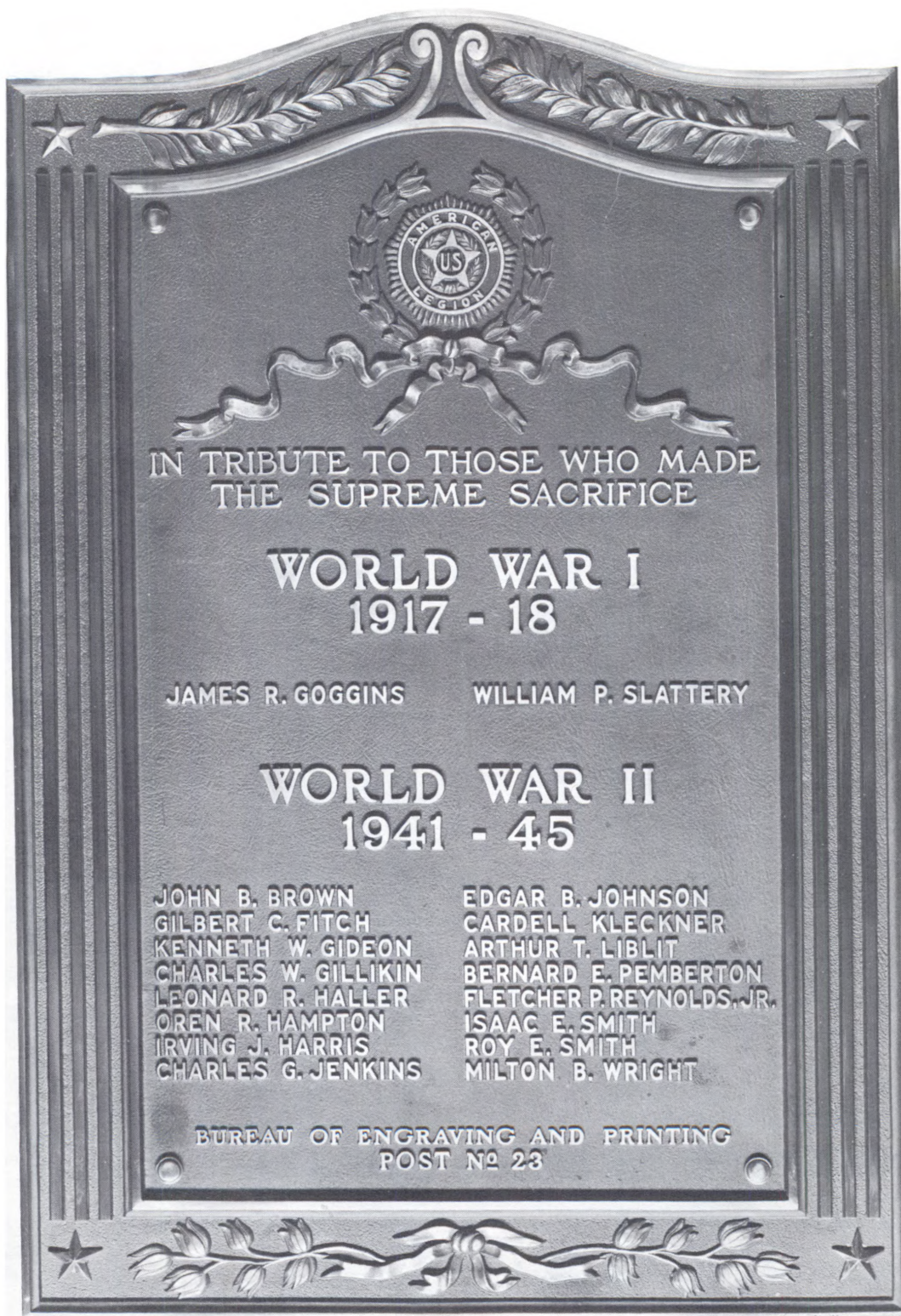
The Bureau's history has been the heartbeat of many people. Each and every employee, beginning with the nucleus of 6 on that summer day of August 29, 1862, down through the years until today's force of almost 3,000 persons, has made his contribution to the Bureau's success. No matter how small the task, it has been an integral part of "getting the job done." There have been countless numbers who have lived and labored as though it were "their" Bureau. And truly it is theirs, for they did everything in their power to make it a better place to work and showed such pride in their perform-

ance that no order was too big or too small as long as the end results were the best obtainable.

Today, the Bureau rededicates itself toward fulfillment of its statutory mandate, that it shall perform its functions with economy, perfection, and safety. Time passes swiftly and inexorably. As new or refined reproduction devices and methods become available, new challenges

for the Bureau and the Secret Service have to be met to deter and suppress counterfeiting. Eternal vigilance is the preface in guarding against surreptitious reproduction of our currency—a currency which has gained widespread acceptance at home and abroad.

As with the famous bard, the Bureau looks upon the past as but a prologue to the future.



Bibliography

- ADAMS, JAMES TRUSLOW (ed.). *Album of American History*. Vol. I, "Colonial Period"; Vol. II, "1783-1853." New York: Charles Scribner's Sons, 1944.
- AMES, MARY CLEMMER. *Ten Years In Washington: Life and Scenes in the National Capital as a Woman Sees Them*. Cincinnati: Queen City Publishing Co., 1874, 587 pp.
- AMERICAN NUMISMATIC ASSOCIATION. *Selections from The Numismatist: United States Paper Money, Tokens, Medals, and Miscellaneous*. Racine, Wis.: Whitman Publishing Co., 1960, 317 pp.
- BAKER, L[AFAYETTE] C. *History of the United States Secret Service*. Philadelphia: Privately printed, 1867, 704 pp.
- BATHE, GREVILLE AND DOROTHY. *Jacob Perkins, His Inventions, His Times and His Contemporaries*. Philadelphia: Historical Society of Pennsylvania, 1943, 215 pp.
- BAYLEY, RAFAEL A. *The National Loans of the United States From July 4, 1776 to June 30, 1880*. Washington: Government Printing Office, 1881, 197 pp.
- BLAKE, GEORGE H. *United States Paper Money: A Reference List of Paper Money Including Fractional Currency Issued Since 1861*. New York: Privately printed, 1909, 55 pp.
- BOARD OF GOVERNORS OF THE FEDERAL RESERVE SYSTEM. *The Federal Reserve System: Purpose and Functions*, 4th ed. Washington: Privately printed, 1961, 238 pp.
- BOSTON, WILLIAM C. "Coin Shortage," *The Numismatist*, Vol. 69, No. 8 (August 1956), p. 884-885.
- BOWEN, WALTER S., and NEAL, HARRY E. *The United States Secret Service*. Philadelphia: Chilton Co. (Book Division), 1960, 205 pp.
- BOYD, JAMES P. (ed.). *Triumphs and Wonders of the 19th Century: The True Mirror of a Phenomenal Era*. (No publisher), 1899, 720 pp.
- BROOKMAN, LESTER G. *The 19th Century Postage Stamps of the United States*. Vol. I. New York: H. L. Lindquist, 1947, 319 pp.
- BUREAU OF ENGRAVING AND PRINTING COOPERATIVE LUNCH ASSOCIATION. *The Cooperator, 1921-1922*. Washington: Privately printed, 1922, 48 pp.
- BUREAU OF ENGRAVING AND PRINTING MUTUAL RELIEF ASSOCIATION. *Year Book, 1903-1904*. Washington: Privately printed, 1904, 72 pp.
- CAROTHERS, NEIL. *Fractional Money: A History of the Small Coins and Fractional Paper Currency of the United States*. New York: John Wiley & Sons, Inc., 1930, 372 pp.
- CHRISTOPH, ART, and KRAUSE, CHET. *United States Postage and Fractional Currency, 1862-1872*. Iola, Wis.: (Reprinted from *Numismatic News*), 1958, 39 pp.
- COFFIN, JOSEPH. *Our American Money*. New York: Coward-McCann, Inc., 1940, 153 pp.
- DEKNIGHT, WILLIAM. *History of Currency of the Country and of the Loans of the United States from the Earliest Period to June 30, 1896*. 2d ed. Washington: Government Printing Office, 1900, 277 pp.
- DILLISTIN, WILLIAM H. *National Bank Notes in the Early Years*. Paterson, N.J.: (Reprinted from the *Numismatist*, Vol. 41, No. 12, December 1948), 24 pp.
- . *A Descriptive History of National Bank Notes, 1863-1935*. Paterson, N.J.: Privately printed, 55 pp.
- DONALD, DAVID. (ed.) *Inside Lincoln's Cabinet: The Civil War Diaries of Salmon P. Chase*. New York: Longmans, Green & Co., 1954, 432 pp.
- DOSTER, WILLIAM E. *Lincoln and Episodes of the Civil War*. New York: G. P. Putnam's Sons, 1915, 282 pp.

- DUPUY, WILLIAM ATHERTON. *Money*. Boston: D. C. Heath & Co., 1927, 181 pp.
- ELLIS, JOHN B. *Sights and Secrets of the National Capital*. New York: U.S. Publishing Co., 1869, 512 pp.
- Evening Star* (Washington, D.C.) 1864, 1918, 1922, 1923, 1928
- FIELD, MAUNSELL BRADHURST. *Memories of Many Men and Some Women*. New York: Harper & Bros., 1874, 339 pp.
- FIELDING, MANTLE. *American Engravers Upon Copper and Steel*. Philadelphia: Privately printed, 1917, 365 pp.
- . *Dictionary of American Painters, Sculptors, and Engravers*. New York: Paul A. Struck, 1945, 433 pp.
- FLADER, LOUIS, and MERTLE, J. S. *Modern Photoengraving: A Practical Textbook on Latest American Procedures*. Chicago: Modern Photoengraving Publishers, 1948, 344 pp.
- FRANKLIN, BENJAMIN. *Autobiography*. Boston: Houghton Mifflin Co., 1923, 286 pp.
- FRIEDBERG, ROBERT. *Paper Money of the United States: A Complete Illustrated Guide with Valuations*. 3d ed. New York: The Coin and Currency Institute, Inc., 1959, 303 pp.
- GABRIEL, R. H. (ed.) "American Money," p. 283-297, and "Banking," p. 298-311, *Pag-eant of America*, Vol. IV. New Haven: Yale University Press, 1927.
- GRIFFITHS, WILLIAM H. *The Story of the American Bank Note Company*. New York: Privately printed, 1959, 92 pp.
- GROCE, GEORGE C., and WALLACE, DAVID H. *The New-York Historical Society's Dictionary of Artists in America, 1564-1860*. New Haven, Conn.: Yale University Press, 1957, 759 pp.
- HAHN, GEORGE C. *United States Famous American Series of 1940*. State College, Pa.: American Philatelic Society, Inc., 1950, 193 pp.
- HARMER, GORDON P., and COSTALES, EUGENE N. *Scott's Specialized Catalogue of United States Stamps*. 40th ed. New York: Scott Publications, 1962, 641 pp.
- HEPBURN, A. BARTON. *A History of Currency in the United States*. Rev. ed. New York: Macmillan Co., 1924, 573 pp.
- HOOPER, RICHARD T. "Financial History of Colonial Virginia." *The Numismatist*, Vol. 66, No. 11, November 1953, p. 1138-1152; No. 12, December 1953, p. 1266-1282.
- HOWARD, GEORGE P. *The Stamp Machines and Coiled Stamps*. New York: Lindquist Publications, 1943, 127 pp.
- JOHL, MAX G. *The United States Commemorative Stamps of the Twentieth Century*. Vol. I (1901-35), Vol. II (1935-47). New York: H. L. Lindquist, 1947, 356 and 382 pp.
- . *United States Postage Stamps of the Twentieth Century*. Vol. III (1922-35), Vol. IV (1933-37). New York: H. L. Lindquist, 1935 and 1938, 286 and 309 pp.
- KEIM, DEB. RANDOLPH. *Keim's Illustrated Hand-Book of Washington and Its Environs: A Descriptive and Historical Handbook of the Capital of the United States of America*. 15th ed. (Corrected to 1881.) Washington: Privately printed, 1881, 252 pp.
- KING, DAVID H., GIBBS, A. JUDSON, and NORTHUP, JAY H. *History of the 93rd Regiment, New York Volunteer Infantry, 1861-1865*. Milwaukee, Wis.: Assoc. 93 N.Y.S.V. (Vols.), 1895, 639 pp.
- KING, BEVERLY S., and JOHL, MAX G. *The United States Postage Stamps of the Twentieth Century*. Vol. I (1901-22), Vol. II (1923-1933). New York: H. L. Lindquist, 1934, 371 and 269 pp.
- KNIGHT, EDWARD H. *American Mechanical Dictionary*. (3 vols.) New York: J. B. Ford & Co., 1875, 2,831 pp.
- KUNZE, ALBERT (ed.). *The Presidential Series Manual*. Pittsburgh: Tanki Mail Advertising Service, 1939, 43 pp.
- LAMON, WARD HILL (edited by Dorothy Lamon Teillard). *Recollections of Abraham Lincoln, 1847-1865*. Washington: Privately printed, 1911, 337 pp.
- LIMPERT, FRANK ALVIN (comp.). *United States Paper Money, Original Series, Series 1861-1923, Inclusive*. 3d ed. rev. Royal Oak, Mich.: Privately printed, 1948, 110 pp.
- LLOYD, ROBERT H. "National Bank Notes, Federal Reserve Bank Notes, Federal Re-

- serve Notes. 1928-1950." *The Coin Collector's Journal*. Vol. 20, No. 1 (January-February 1953), p. 1-16.
- LOGAN, MRS. JOHN A. *Thirty Years in Washington: Life and Scenes in Our National Capital*. Hartford, Conn.: A. D. Worthington & Co., 1901, 752 pp.
- LUFF, JOHN N. *The Postage Stamps of the United States*. New York: Scott Stamp & Coin Co., Ltd., 1902, 320 pp.
- McCULLOCH, HUGH. *Men and Measures of Half a Century*. New York: C. Scribner's Sons, 1888, 542 pp.
- MOORE, FRANK. *The Rebellion Record: A Diary of American Events*. Vol. 7. New York: Van Nostrand, 1864, 604 pp.
- MORRIS, THOMAS F. "History of the Bureau of Engraving and Printing." *The Stamp Specialist—Gray Book*. New York: H. L. Lindquist, 1943, p. 92-119.
- NEWMAN, ERIC P. "Counterfeit Continental Currency Goes to War." *The Numismatist*, Vol. 70, No. 1 (January 1957), p. 5-16.
- NUSSBAUM, ARTHUR. *A History of the Dollar*. New York: Columbia University Press, 1957, 308 pp.
- OTTLEY, WILLIAM YOUNG. *An Inquiry into the Origin and Early History of Engraving*. 2 vols. London: John & Arthur Arch, 1816, 836 pp.
- ST. CLAIR, LABERT. *The Story of the Liberty Loans*. Washington: James William Bryan Press, 1919, 186 pp.
- SCHMECKEBIER, LAURENCE F. *The Bureau of Engraving and Printing; Its History, Activities, and Organization*. (Institute of Government Research of the Brookings Institution; Service Monograph of U.S. Government, No. 56). Baltimore: Johns Hopkins Press, 1929, 111 pp.
- SPELTZ, ALEXANDER. (Translated from the 2d ed. by David O'Connor.) *Styles of Ornament*. New York: Grossett & Dunlap, no date, 647 pp.
- STAUFFER, DAVID MCNEALY. *American Engravers Upon Copper and Steel*. 2 vols. New York: Grolier Club, 1907, 391 and 566 pages.
- U.S. CIVIL SERVICE COMMISSION. *History of the Federal Civil Service, 1789 to the Present* [1941]. Washington: Government Printing Office, 1941, 162 pp.
- U.S. COMPTROLLER OF THE CURRENCY. "History and Development of the National Bank Note." *73d Annual Report of the Comptroller of the Currency*. Washington: Government Printing Office, 1935, p. 817-842.
- U.S. DEPARTMENT OF AGRICULTURE. *Farmers in a Changing World: 1940 Yearbook of Agriculture*. Washington: Government Printing Office, 1940, 1,213 pp.
- U.S. DEPARTMENT OF STATE. *The History of the Seal of the United States*. Washington: Government Printing Office, 1909, 72 pp.
- U.S. POST OFFICE DEPARTMENT. *Postage Stamps of the United States: An Illustrated Description of All United States Postage and Special Service Stamps Issued by the Post Office Department from July 1, 1847 to December 31, 1961*. Washington: Government Printing Office, 1962, 229 pp.
- U.S. POSTMASTER GENERAL. *Annual Reports of (1894-1961)*. Washington: Government Printing Office.
- U.S. PUBLIC BUILDINGS COMMISSION. *Public Buildings in the District of Columbia*. (S. Doc. 155, 65th Cong., 2d sess.) Washington: Government Printing Office, 1918, 614 pp.
- U.S. SECRETARY OF THE TREASURY. *Annual Reports of the Secretary of the Treasury on the State of the Finances (1861-1960)*. Washington: Government Printing Office.
- U.S. SECRET SERVICE. *Know Your Money*. Rev. Washington: Government Printing Office, 1960, 32 pp.
- UNIVERSITY OF CHICAGO. "Banknotes." *Encyclopaedia Britannica*. (1947 ed.) Vol. 3, p. 51-53.
- VALENTINE, DANIEL W. *Fractional Currency of the United States*. (2 vols. in one.) New York: F. C. C. Boyd, 1924, 53 and 48 pp. *Washington Post*. 1910, 1919.
- WEITENKAMP, FRANK. *How To Appreciate Prints*. New York: Moffatt, Yard & Co., 1908, 330 pp.
- WILHELM, DONALD. "Paul Revere Without His Horse." *Nation's Business*. Vol. 20, No. 4 (April 1932), p. 35-38, 64.

Index

A	
Acts of Congress:	Page
12 Stat. 259—July 17, 1861.....	1
12 Stat. 313—August 5, 1861.....	2
12 Stat. 346—February 25, 1862.....	2
12 Stat. 432—July 1, 1862.....	27
12 Stat. 532—July 11, 1862.....	5, 16
12 Stat. 592—July 17, 1862.....	9
12 Stat. 665—February 25, 1863.....	21
12 Stat. 711—March 3, 1863.....	3, 11
13 Stat. 220—June 30, 1864.....	11
13 Stat. 222.....	36
14 Stat. 25.....	12, 132
15 Stat. 312—March 3, 1869.....	24
18 Stat. 110—June 20, 1874.....	24
19 Stat. 152.....	29
20 Stat. 211.....	43
20 Stat. 357.....	58
21 Stat. 260—June 16, 1880.....	46
21 Stat. 376.....	62
24 Stat. 607.....	34
25 Stat. 511.....	35
25 Stat. 945.....	35
26 Stat. 374—August 30, 1890.....	46
30 Stat. 18—July 11, 1896.....	24
30 Stat. 604.....	107
30 Stat. 1082.....	107
30 Stat. 1090.....	29
31 Stat. 589—June 6, 1900.....	48
32 Stat. 952—March 2, 1903.....	66
32 Stat. 1039.....	48
32 Stat. 1211.....	48
34 Stat. 475.....	65
34 Stat. 1306.....	86
34 Stat. 1309.....	107
35 Stat. 319—May 27, 1908.....	88
37 Stat. 34—August 1911.....	89
37 Stat. 430—August 24, 1912.....	95, 107
37 Stat. 595—August 26, 1912.....	78
38 Stat. 745—October 22, 1914.....	95
39 Stat. 360—July 17, 1916.....	92
40 Stat. 349—October 6, 1917.....	106
41 Stat. 44—July 11, 1919.....	106
42 Stat. 1099—January 3, 1923.....	108
47 Stat. 583.....	39
49 Stat. 600—August 13, 1935.....	128
49 Stat. 1640—June 1936.....	129
64 Stat. 408—August 4, 1950.....	165
69 Stat. 290—July 11, 1955.....	177
March 9, 1933.....	116
Emergency Bank Act.....	117
Pendleton Act.....	55

Acts of Congress—Continued	Page
Salary Act of 1853.....	55
Urgent Deficiency Bill for 1918.....	106
Veterans Bonus Bill—January 27, 1936.....	120
See also Appropriation acts.	
Agriculture, Department of.....	43,
48, 87, 134, 135	
Alaska-Yukon-Pacific Exposition.....	27
Albania.....	149
Allied Military currency:.....	143, 145, 146
Austrian schilling.....	146
German mark.....	146, 153—155
Italian lire.....	143, 145
Allied Military postage stamps.....	144, 147
Alto.....	108, 175, 176
American Bank Note Co.—1, 18, 107, 119, 149, 176	
American Chemical Society.....	92
American Red Cross.....	87, 100, 150, 151
Antipower-press campaign.....	107
Appropriation acts:	
18 Stat. 110—June 20, 1874.....	24
21 Stat. 376—Post Office Department, 1881.....	62
25 Stat. 945—For 1890.....	35
37 Stat. 595—August 26, 1912.....	78
Post Office Department, 1879.....	62
Armistice.....	102
Army, U.S.....	143, 147, 153
Astronauts:	
Glenn, John.....	183
Shepard, Alan.....	181
Audubon, John James.....	133
Austin, Erwin.....	132
Australia.....	148
Austria.....	90, 144, 149, 153
Automatic delivery devices.....	74, 162
Automatic feeders.....	162—163
Automatic wipers.....	160, 162
Aviators' emergency money packets.....	149
Awards:	
Dem Verdienste.....	24
Diploma de Honor.....	27
Diplome d'Honneur.....	27
First International.....	24—27
Gold Medal.....	27
Grand Prix.....	27
Grand Prize.....	27
Length-of-service.....	56
Medal of Honor.....	27
Axis Powers.....	137, 143, 149

B		Page
Baker, Lafayette C.	16, 17, 19, 37	
Baldini, Baccio		xii
Banknote industry	xiv, xv, 15, 130, 170	
Banknote printing		xvii, xviii
Banks of England and France		40
Barytes		97
Basso	108, 109, 176	
Battle of Coral Sea		142
Battle of Midway		142
Bauer, Charles H.		132
Beer stamps	28, 29, 107	
Belgium		149
Bell, Hiram P. (M.C.)		32
Bennett, Charles (M.C.)	176, 177	
Beta-ray apparatus		169
Bicolor postage stamps	132, 168, 173, 179	
Bicolor savings stamps		141
Blood donor program		151
Bonds	106, 139	
Adjusted service		120
"Baby"	119-121, 139	
Bonus		121
Defense	96, 137, 139	
Duplicate	104-106	
Early		11
Federal Farm Mortgage Corpora- tion		120
Five-Twenties of 1862		14
Home Owners' Loan Corporation		120
Liberty Loan	92-95, 99, 100, 102, 103, 104, 106, 138, 139	
Postal savings		141
Savings	96, 119-121, 151, 165	
Ten-Twenties of 1864		15
Victory Loan		94
War savings	96, 138-140	
Books, postage stamp		65
Bottled liquor strip stamps		97
Boutwell, George S.		37
Boy Scouts		139
British-American Bank Note Co., Ltd.		172
British Army		xiv
British Embassy		91
British Government	91, 144, 147	
Bronzing	4, 10, 11	
Brooks, James (M.C.)		17
Brown, Alonzo Y.		55
Brown, Emma S.	55, 56	
Budget, Bureau of the		165
Budget, business-type		165
Buffalo, New York		99
Buildings, Bureau	40-49	
Annex	90, 128-130, 131, 137, 150	
Main	42, 46, 57, 84-90, 98, 103, 128, 129, 130, 152	
Red brick	47, 48, 87, 88, 151	
Bureau of Construction (Treasury De- partment)		2, 3
Bureau of Efficiency		111
Bureau of Engraving and Printing, Page title 23-24, 48		
Bureau of Insular Affairs (War Depart- ment)		66
Bureau of the Mint (Treasury Depart- ment)	43, 122, 124, 132	
Bureau of the Public Debt (Treasury Department)	78, 128, 139, 150	
Bureau, tours of	151-153	
Burin		xi
Burt, Charles		7, 61
C		
California, State of, Bureau of Printing		146
Canada		xiii
Cape Canaveral		183
Casilear, George W.	8, 13	
Centennial Commission, U.S.		26
Centennial Exposition, 1876	26, 156	
Certificates (as securities)	38, 99	
Charwomen		55
Chase, Salmon P.	1, 3, 4, 5, 9, 16, 19, 20, 22, 35, 36	
Checks	97, 102, 117-119	
Chief, Bureau of Engraving and Print- ing. <i>See</i> Director.		
Chroming of plates		109
Cigar stamps	29, 34, 71, 107	
Cigarette stamps	27, 28, 29, 71, 96	
Civil Service	51-57, 92, 103, 105	
Civil War	xviii, 1, 9, 16, 27, 52, 53, 95	
Clark, Spencer M.	1, 2, 3, 4, 5, 7, 8, 11, 12, 13, 16, 17, 18, 19, 20, 21, 22, 23, 35, 40, 41, 53, 54, 115, 151, 166, 171, 172	
Cleveland, Grover	8, 55, 133	
Clinton, DeWitt	27, 28, 96	
Coast Guard, U.S.		146
Code, United States		36, 39
Coiled postage stamps. <i>See</i> Postage stamps.		
Coins	xiii, xviii, 9, 58	
Commemorative postage stamps. <i>See</i> Postage stamps.		
Commission of Fine Arts		89
Commissioner of Internal Revenue	27, 29	
Commissioners, District of Columbia		102
Committee, French National Libera- tion		144
Committee, French postage stamps		147
Committees:		
Congressional		17
House:		
Appropriations	59, 81, 87, 88, 99, 107	
Appropriations subcom- mittee		178
Banking and Currency	32, 104, 177	
Select		16, 22
Joint: Select, on Retrench- ment		22, 23, 54

- Committees—Continued
- Congressional—Continued
- Senate:
- Appropriations 153
- Armed Services 153
- Banking and Currency 153
- Finance 30
- Military Affairs 106
- Printing 108
- Public Buildings and
Grounds 43
- Departmental 41, 58
- Compound interest notes 3, 13
- Compound liquor stamps 29
- Comptroller, First or Second (Treasury
Department) 2
- Comptroller of the Currency (Treasury
Department) 21, 22, 23, 81
- Confederacy 61
- Congress (*see also* Committees, Con-
gressional) 1, 2, 12, 13, 17, 23, 35,
40, 45, 46, 47, 58, 86, 88, 89, 100, 153,
165
- Congressional acts. *See* Acts of Con-
gress.
- Congressional committees. *See* Com-
mittees.
- Construction, Bureau of (Treasury De-
partment) 2, 3
- Congressmen:
- Bell, Hiram P. 32
- Bennett, Charles 176, 177
- Brooks, James 17
- Jenckes, Thomas Allen 53
- Continental Bank Note Co. 22
- Continental Congress xiii
- Continental currency xiii, xiv
- Coolidge, Calvin 105
- Copperplate printing xii, xiii, xiv, xv
- Coral Sea, Battle of 142
- Corcoran, William W. 43
- Cotton, distinctive paper 78
- Cotton order stamps 134, 135
- Counterfeit xi,
xiii, xiv, xvii, 2, 11, 18, 35, 36, 79, 90,
113, 114, 130, 144, 145, 154, 180
- Cox, Kenyon 111
- Crane & Co. 37, 39
- Cross, Maggie 56
- Crystal Palace (London) 24
- Cuba, Republic of 65, 66, 67, 124
- Cubán currency 66, 124
- Cuban postage stamps 66, 67
- Currency— 59, 65, 106, 108, 142, 143, 144, 153
- Allied Military 143–146, 153–155
- Cuban 66, 124
- Denominational-portrait design 114
- Designs 110, 111, 112, 121–123
- Destruction 77
- Dry printing of 18–20,
39, 109, 156, 172–176, 177
- 8-subject 112, 137
- Currency—Continued
- Page
- 18-subject 159–162
- Emergency 116–117
- Federal, need for xviii
- First Colonial xiii
- First U.S. Government 1, 13
- Foreign, *not* printed 123–124
- 4-subject 3
- Fractional 8–13, 19, 20, 36, 37, 172
- French franc 143, 146
- Hawaiian 142–143
- Invasion 141–147
- Korean 124–125
- Laundering machines 76–79
- Military 143, 144, 147, 153
- Notes:
- Compound interest 3, 13
- Demand 1
- Federal Reserve 81, 112, 114,
117, 121, 142, 163–165, 170, 171
- Federal Reserve Bank 102, 116–117
- Gold certificates 58,
72, 110, 114, 121
- Interest bearing 3
- National Bank 22,
38, 59, 110, 112, 114, 115, 121, 176
- Non-interest bearing 2
- Silver certificates 72,
102, 107, 110, 114, 121, 142,
143, 150, 163, 164, 176.
- Treasury 3, 4, 5, 13, 21, 107, 165
- U.S. - 5, 37, 38, 58, 72, 107, 110, 114
- Notes, loss of 151, 166–167
- Numbering 59, 112, 113, 121
- Overprinting 114, 115, 159, 163, 164
- Paper, distinctive 35–39,
78–79, 114, 124, 173–174
- Philippine 65–67, 110, 148, 149
- Plates. *See* Plates.
- Postage. *See* Fractional.
- "R" and "S" notes 149–150
- Redemption of 149–150
- Sealing 2–5, 57–59, 72–73, 121
- Sealing, trimming, and separat-
ing 3, 21, 59
- Seals, distinct colors 121
- Separation of notes 72, 73
- "Shinplaster" 9
- Siamese 124
- Small-sized notes 17,
38, 66, 110, 114, 115, 130, 157, 159
- Soiled 76–79
- 32-subject 175, 176, 177
- Trimming and separating 3–5, 21
- 12-subject 112, 137, 157
- Uncut sheets 59, 114
- Uniform back design 111, 114
- Yellow seal 143
- Custodian, dies and rolls 8
- Custom cigar stamps 28, 29
- Custom wine stamps 71
- Czechoslovakia 149

D

	Page
Declaration of Independence.....	26, 123
Delivery and production statistics.....	13
20, 24, 28, 29, 34, 46, 61, 62, 64, 66,	
71-78, 96, 102, 109, 120, 127, 136,	
139, 141, 145, 148, 150, 163, 167, 176	
Delnoce, Louis.....	7
<i>Dem Verdienste</i> medal.....	24
Demand notes.....	1
Denatured alcohol stamps.....	29
Denmark.....	149
Depression of 1837.....	9
Depression of early 1930's.....	115-116
Detroit, Michigan.....	183
Die sinker.....	xvi
<i>Diploma de Honor</i>	27
<i>Diplome d' Honneur</i>	27
Directors, Bureau of Engraving and	
Printing.....	33, 50, 52, 55, 62, 70, 73, 74,
76, 81, 86, 91, 97, 99, 106, 108, 110,	
128, 151, 153, 154, 155, 157, 165, 167,	
176	
Clark Spencer M.....	1,
2, 3, 4, 5, 8, 11, 12, 13, 16, 17, 18, 19,	
20, 21, 22, 23, 35, 40, 41, 53, 54, 115,	
151, 166, 171, 172	
Graves, Edward O.....	59
Irish, O. H.....	6, 7, 17, 20, 151
Kirby, Wallace W.....	105, 106
McCartee, George B.....	17,
23, 60, 151, 166	
Ralph, Joseph E.....	89
Sullivan, Thomas J.....	49, 57
Wilmeth, James L.....	104, 105
Dismissals, employees.....	103-106
Disbursing Officers, U.S.....	118
Distilled spirits stamps.....	28, 29
Distillery warehouse stamps.....	71
Distinctive currency paper.....	35-39,
78-79, 114, 124, 173-174	
Distributed fiber paper.....	37, 38, 114, 124
District of Columbia, Commissioners	
of.....	102
Documentary stamps.....	27, 29, 57, 99
Dry printing.....	18-20,
39, 109, 156, 172-176, 177	
Drying rooms.....	158
Dürer, Albrecht.....	xii
Duthie, James.....	5, 6, 7

E

East Potomac Park.....	48
Edison, Thomas A.....	52
Edwins, Charles C.....	22
1864 investigation.....	13, 16, 17
Eisenhower, Dwight D.....	177
Electric-eye perforator.....	69,
125-128, 137, 169	
Electrodeposition.....	108
Electrolytic plant.....	109

Page

Electrolytic plates.....	103, 108-109, 175-176
Electrolytic process.....	103, 108-109, 175-176
Electrotypes.....	95
Elevators.....	50
Emergency Bank Act.....	118
Emergency currency.....	116-117
Employees:	
Band.....	53
Dismissal of 29.....	103-106
538 dropped.....	58
Furloughs.....	115-116
Longevity.....	55-57
Personal effort.....	99-101, 150-151
Reductions in force.....	103, 121, 178
England.....	xiii, 90, 156
England, Bank of.....	40
Engravers:	
Burt, Charles.....	7, 61
Casilear, George W.....	8, 13
Delnoce, Louis.....	7
Duthie, James.....	5, 6, 7
First.....	5
Gugler, Henry.....	8
Hall, Edward M.....	56
Hobart, Elisha.....	7, 8
McCoy, George.....	61
McLees, Archibald.....	6, 7
Original staff.....	7-8
Ourdan, Joseph James P.....	7
Ourdan, Joseph P.....	6, 7
Portrait.....	6
Prud'homme, John F. E.....	7
Sealey, Alfred.....	7
Etching.....	xi
Euclid's <i>Principles</i>	xii
Examining operations.....	74-75, 98, 158
Executive order.....	103, 104, 105
Exhibitions.....	24
Great, 1851.....	24
Vienna.....	24, 26
Expositions:	
Alaska-Yukon-Pacific.....	27
Centennial, Declaration of Inde-	
pendence.....	26, 156
Ibero-American, 1929-30.....	27
Pan-American.....	179
Panama-Pacific International.....	27
Paris Universal, 1878.....	27
Philadelphia Sesquicentennial.....	27
Trans-Mississippi-"Omaha".....	179
World's Columbian.....	24

F

Farley, James A.....	120, 134
Federal Civil Works Administration.....	118
Federal Farm Loan Board.....	92
Federal Farm Mortgage Corporation.....	120
Federal Reserve Bank notes.....	102, 116-117
Federal Reserve notes.....	81, 112,
114, 117, 121, 142, 163-165, 170, 171	

- | | Page | | Page |
|---|-------------------------------|---|---|
| Federal Reserve system | 111, 164 | Grant, Ulysses S. | 15 |
| Bank of New York | 116 | Graver | xi |
| Bank of Richmond | 164 | Graves, Edward O. | 59 |
| Bank of San Francisco | 117, 118 | Gravure printing | xi, 180 |
| Ferguson, Frank E. | 89 | Great Exhibition, 1851 | 24 |
| Fine Arts, Commission of | 89 | Great Seal of the United States | 121-123 |
| Finiguerra, Maso | xii | Greece | 149 |
| Fire, Bureau plant | 100 | Greenbacks | 17-18, 34 |
| Fire escapes | 48 | Guam | 65, 67, 142 |
| Firemen | 41 | Gugler, Henry | 8 |
| First-day covers, Project Mercury postage stamp | 183 | Gugler Lithographic Co. | 8 |
| Fisher, James M. | 104 | Guides for visitors | 151-153 |
| Fiscal activities, survey of | 165 | Gumming. <i>See</i> Machinery. | |
| Flag Day, 1916 | 99, 100, 101 | Gwynn, Stuart | 19, 35, 36, 37 |
| Flatbed presses. <i>See</i> Machinery: presses. | | | |
| Florida, State seal | 176 | H | |
| Flour stamps | 29 | Hall, Edward M. | 56 |
| Foggy Bottom area | 48 | Hall of Fame, New York University | 134 |
| Folger, Charles J. | 32 | Hand polishing | xii, 162 |
| Food order stamps | 134-136 | Hand roller | xii |
| Food stamp coupons | 135-136 | Hand roller presses | xii, 13, 20, 31, 32, 72, 84, 94, 95, 107, 108, 115, 162 |
| Forbes Lithograph Manufacturing Co. | 146, 154 | Harding, Warren G. | 104, 105 |
| Foreign currencies, <i>not</i> printed | 123-124 | Harper's Ferry, W. Va. | 7 |
| Fort Sumter | 1 | Hawaii | 142 |
| Foster, Stephen Collins | 133 | Hawaiian currency | 142-143 |
| Fractional currency | 8-13, 19, 20, 36, 37, 172 | Hayes, Rutherford B. | 41 |
| France | 144, 149 | Hertz, Heinrich | 125 |
| France, Bank of | 40 | Hill, James G. | 43 |
| Franklin, Benjamin | xiii, 60, 133 | History of the Federal Civil Service—1789 to the Present [1941] | 52 |
| Freeman, Orville L. | 135 | Hobart, Elisha | 7, 8 |
| French Committee of National Liberation | 144 | Holland | 91, 92, 149 |
| French, Daniel Chester | 140 | Home Owners' Loan Corporation bonds | 120 |
| French franc currency | 143, 146 | Homer Lee press | 32-34 |
| French Republic, Provisional Government of | 144 | Hoole, John R. & Sons. | 23 |
| Furloughs | 115-116 | Hoover, Herbert | 132 |
| | | Horses | 101-102 |
| G | | House of Representatives (<i>see also</i> Committees: Congressional) | 23, 26, 86, 87, 156 |
| Garfield, James A. | 17, 112, 156 | Huebner-Bleistein Co. | 99 |
| Gathering and stitching machines | 139-140 | Humidors | 158 |
| Gebrueder Heyl & Co. | 91 | Hydrostatic printing | 18-20, 115, 130, 172 |
| Geddes, Annie | 56 | | |
| General Accounting Office | 165 | I | |
| General Counsel of the Treasury | 167 | Ibero-American Exposition, 1929-30 | 27 |
| General Postal Union | 61 | Idlitz, Mr. | 7 |
| Gerhardt, Teresa M. | 56 | Imperforate sheets, postage stamps | 68 |
| Germany | 8, 90, 91, 143, 144, 153, 154 | "In God We Trust" | 173, 176-179 |
| Gibson, W. J. | 30 | Independence, War of | 140 |
| Girl Scouts | 139 | Inks | xi, 47, 169 |
| Glass, Carter | 93 | Dry colors for | 90-92, 155 |
| Glenn, John | 183 | Heat-set | 169 |
| Gold certificates | 58, 72, 110, 114, 121 | Ingredients | 97, 131, 144, 145, 154, 158, 173 |
| Gold medal | 27 | Nonoffset | 131, 157-159, 162 |
| Government Printing Office | 48 | Waste | 74, 131 |
| Government transportation requests | 102 | | |
| Grand Prix | 27 | | |
| Grand Prize | 27 | | |

Internal Revenue:	Page
Commissioner of	27, 29
Stamps	27-30,
57, 71, 93, 95, 99, 102, 103, 106, 107	
Beer	28, 29, 107
Bottled liquor strip	97
Cigar	29, 34, 71, 107
Cigarette	27, 28, 29, 71, 96
Compound liquor	29
Deliveries of	28, 29, 30, 71
Denatured alcohol	29
Distilled spirits	28, 29
Distillery warehouse	71
Documentary	27, 29, 57, 99
Flour	29
Liquor dealers	29
Malt liquor	71
Oleomargarine	29, 107
Parcel post tax	99
Playing card	29, 71
Proprietary	27, 29, 57
Rectified spirits	29
Sheet beer	71
Sheet cigar	71
Sheet tobacco	71
Snuff	29, 107
Special tax	27, 28, 29, 107
Strip cigar	71
Stub tobacco	71
Tax paid	27
Tobacco	28, 34, 107
Wholesale liquor dealer	71
Whiskey	107
Wine	29
System	27
International Exhibition, Centennial	
Declaration of Independence	26, 156
International Printing Pressmen and	
Assistants' Union of North America	95
Invasion currency	141-147
Investigation of 1864	13, 16, 17
Ireland, Wm. M.	61
Irish, O. H.	6, 7, 17, 20, 151
Irving, Washington	133
Italy	143, 144, 146, 147
J	
Jacksonville, Fla.	183
Japan	141, 142, 143, 144, 148, 151
Jenckes, Thomas Allen (M.C.)	53
Job security	178-179
Joint Stock Land Banks	92
Justice, Department of	62, 104, 105
K	
King, Mary	56
Kirby, Wallace W.	105, 106
Knights of Labor of North America	34
Korea	124, 149
Korean conflict	163
Korean currency	124-125

L	
	Page
Laborers	50, 55
Lamon, Ward Hill	176
"Landing of the Pilgrims," Sargent's	7
Laundering currency	76-79
Laws, child labor	50
Lehman, Alice	56
Length-of-service awards	56
Liberty Loan bonds	92-95,
99, 100, 102, 103, 104, 106, 138, 139	
Liberty Loan Building	42
Lincoln, Abraham	1, 2, 8, 9, 14, 112, 176
Linen content, distinctive paper	37-39, 78
Liquor dealers stamps	29
Lithography	xi, 95-97, 124, 144, 146, 180
Loan Branch (Treasury Department)	2, 3
Loans and Currency, Division of	110
Logotypes	117, 121
London, England	24, 150
Longfellow, Henry W.	133
Loss of securities	151, 166-167
Luxembourg	149

Mac—Mc

MacArthur, Douglas	151
MacVeagh, Franklin	110, 111
McAdoo, William G.	111
McCartee, George B.	17, 23, 60, 151, 166
McCoy, George	61
McCulloch, Hugh	22, 23
McLees, Archibald	6, 7

M

Maceration, securities	77
Machinery	13, 16, 46, 98-99
Automatic delivery devices:	
Flatbed plate printing presses	162
Gumming machines	74
Automatic feeders	162-163
Automatic wipers	160, 162
Beta-ray apparatus	169
Coil stamps	67-71
Electric-eye perforator	69,
125-128, 137, 169	
Gathering and stitching	139-140
Gumming	63, 64, 130, 168
Improved	30
Laundering	76-79
Numbering	99, 112, 113, 121
Numbering, sealing, separating,	
collating, and counting	73,
121, 130, 140	
Perforator	70, 71, 74, 125-128, 137
Plater presses	74
Polisher mechanism	162
Presses:	
Cylinder	99
Flatbed	83, 99, 157, 159-163, 172
Hand roller	xii, 13, 20, 31, 32,
71, 84, 94, 95, 107, 108, 115, 162	

Machinery—Continued

Presses—Continued	Page
Homer Lee	32-34
Hydrostatic	13,
18-20, 115, 130, 172	
Lithographic, multicolor	154
Milligan	30-34
Neale-Appleton	32
Offset	95, 99, 145
Overprinting	3, 159
Power, plate printing	30-35, 72,
93, 99, 103, 106-108, 115, 162	
Rotary, intaglio sheet-fed	157,
172-176, 180, 181	
Rotary, web-fed	79-83,
136, 157, 167-169	
Sealing	2-5, 13, 73
"Spider" handled	30
Stamps, coil	67-71
Stamps, high-speed	167-169
Steam plate printing	20,
31, 32, 34-35, 46, 115, 162	
Stickney	79-83, 126, 167-169
Transfer	108
Two-color sheet-fed rotary	159
Two-color typographic flat-	
bed	159
Typographic	74, 95, 159
Semiautomatic feedboards	162
Take-off and delivery devices	162
Trimming machines	5, 72, 73, 112
Trimming and separating	3, 5
Wetting	74, 163
Maine, State of	xvi
Mall	90, 103
Malt liquor stamps	71
Manila	148
Mann, Horace	133
Massachusetts Bay Colony	xiii
Massachusetts, State of	xvi
Medal of Honor	27
Mellon, Andrew W	56, 111, 112
Membrane paper	35-37
Messengers	51
Middleburg, Va	171
Midway, Battle of	142
Military currency	143, 144, 147, 153
Military postage stamps	147, 153
Milligan, James	30, 31, 32, 33
Milligan press	30-34
Mill-wet paper	163
Minneapolis, Minn	34
Mint, Bureau of (Treasury Depart-	
ment)	43, 122, 124, 132
"Minute Man"	140, 141
Mississippi Territory, Seal of	132
Modernization program	157, 163
Montreal, Canada, Bank of	77
Morgenthau, Henry, Jr	120, 123
Morrill, Justin L. (U.S. Senator)	43
Moscow	154
Multicolor postage stamps	131, 179-181

N

National Aeronautics and Space Ad-	Page
ministration	181, 183
National bank currency	22,
38, 59, 110, 112, 114, 115, 121, 176	
National Bank Note Co	1
National banks	114, 115
National Bureau of Standards	108, 111, 148
National Currency Bureau	12, 21, 22
National Farm Loan Associations	92
National Note Bureau	21
National Paper	36
National Philatelic Museum	179
Navy, U.S.	147, 148
Navy Department	66, 137, 144, 146, 148
Navy yards	48, 147
Neale-Appleton press	32
Neale, Charles	6, 7
Netherlands	91, 149
New Jersey colony	xiii
New York stock market	115
New York Times	12
New York University, Hall of Fame	134
New York World	16
Niagara Lithograph Co	99
Niello	xi, xii
93d N.Y. Volunteer Infantry	7
Nonoffset inks	131, 157-159, 162
North Africa	143
Norway	149
Note Bureau	21
Notes. See Currency.	
Numbering of currency	59, 112, 113, 121
Numbering machines	15, 99, 112, 113, 121
Nylon fibers, distinctive paper	39

O

Office of Research and Development	
Engineering	130
Official Register of the United States	21
Offset printing	30,
93, 95-98, 99, 105, 118, 145	
Old Capitol Prison	19
Oleomargarine stamps	29, 107
188th Pennsylvania Volunteers	56
O'Neill, Bridget C	56
Oosterdyk	91
Ourdan, Joseph James P	7
Ourdan, Joseph P	6, 7
Overprinting. See Currency; Postage stamps.	

P

Pacific Fleet, Commander of Aircraft	149
Pan-American Exposition	179
Panama-Pacific International Exposi-	
tion	27

- Paper:**
- Distinctive..... xi, 39, 175
 - Currency..... 35-39, 78-79, 114, 124, 173-174
 - Fractional currency..... 36, 37
 - Linen content..... 37-39, 78
 - Membrane..... 35-37
 - Produced in Department..... 36
 - Unlawful to possess..... 36
 - Distributed fiber..... 37, 38, 114, 124
 - Localized fiber..... 37
 - Mills..... 146
 - Mill-wet..... 163
 - National..... 36
 - Pregummed, postage stamp..... 147, 173, 180
 - Spider-leg..... 36, 37
 - Watermarked..... 37
 - Paper specie..... xiii
 - Parade, Flag Day 1916..... 99, 100
 - Parcel post tax stamps..... 99
 - Paris Universal Exposition, 1878..... 27
 - Patronage..... 52
 - Payment for lost securities..... 166-167
 - Payroll savings plan..... 139
 - Pearl Harbor..... 139, 141, 151
 - Pendleton Act..... 55
 - Pennsylvania Avenue..... 94, 100, 103
 - Perforator. *See* Machinery.
 - Perkins, Jacob..... xv, xvi, xvii, 108
 - Personnel statistics..... 13, 16, 23, 40, 58, 92, 98, 99, 103, 104, 121, 138
 - Petersburg, Va..... 56
 - Philadelphia, exhibit, 1876..... 26, 156
 - Philadelphia Sesquicentennial Exposition, 1926..... 27
 - Philatelic Section (Post Office Department)..... 183
 - Philippine currency..... 65-67, 110, 148, 149
 - Philippine Islands..... 65, 66, 67, 142, 148, 149
 - Philippine postage stamps..... 65-67
 - Photography..... 18
 - Photolithographic offset printing..... 95-97
 - Plastic cement..... 109
 - Plate finisher..... 116
 - Plate printers..... 6, 7, 30, 34, 35, 41, 107, 116
 - Neale, Charles..... 6, 7
 - Plater presses..... 74

Plates:

 - Bond..... 139
 - Chroming of..... 109
 - Composition of..... 109
 - Currency:
 - 8-subject..... 102, 112, 114
 - 18-subject..... 159
 - 4-subject..... 3, 102, 108, 114
 - 32-subject..... 109, 175
 - 12-subject..... 112, 114
 - 2-subject..... 114
 - Deep-etch..... 96
 - Electrolytic..... 103, 108-109, 175-176
 - Electrotype..... 95
 - Hand polishing of..... xii, 162

Plates—Continued

 - High-etch..... 96, 97
 - Intaglio..... xi, xv, xvi, 103, 108-109
 - Offset..... 95-98, 99, 103, 105
 - Photolithographic..... 103, 145
 - Planograph..... 96
 - Rechroming of..... 109
 - Russian..... 153-55
 - Steretotype..... xvi, 95
 - Playing card stamps..... 29, 71
 - Point of Rocks, Md..... 8
 - Poland..... 149
 - Porto Rico..... 65, 67
 - Portraits..... xviii, 12, 13, 24, 111, 112, 132
 - Clark, Spencer M..... 12
 - Clinton, DeWitt..... 27, 28, 96
 - Franklin, Benjamin..... 60, 133
 - Garfield, James A..... 112
 - Grant, Ulysses S..... 13
 - Lincoln, Abraham..... 8, 14, 112
 - Spinner, Francis E..... 12, 118
 - Taylor, Zachary..... 61
 - Washington, George..... 10, 15, 60, 112
 - Washington, Martha..... 133
 - Wilson, Woodrow..... 120
 - Post Office Department (*see also* Postmaster General)..... 60, 61, 62, 63, 65, 67, 68, 70, 79, 80, 97, 99, 133, 134, 140, 149, 168, 173, 179, 181, 183.
 - Postage currency. *See* Fractional currency.
 - Postage stamps..... 9, 11, 48, 57, 58, 60-65, 66, 67, 106, 107, 147, 165, 180.
 - Airmail, 5-cent, series 1958..... 169
 - Airmail, 7-cent, series 1958..... 169
 - Airmail, 24-cent, series 1918..... 179
 - Allied military..... 144, 147
 - Bicolor..... 132, 168, 173, 179
 - Billing for..... 65
 - Books..... 65
 - Centenary of..... 61
 - Coiled..... 65, 67-71, 79
 - Commemorative:
 - American Flag, series 1957..... 180
 - Army and Navy..... 134
 - Famous Americans, series 1940..... 133-134
 - First set, Bureau-printed..... 179
 - International Red Cross, series 1952..... 168
 - "Mississippi" Territory, series 1948..... 132
 - "Overrun Countries," series 1943..... 149
 - Pan-American Exposition, series 1901..... 179
 - Project Mercury, series 1962..... 181-185
 - Remington, Frederic, series 1961..... 181
 - Trans-Mississippi - "Omaha" Exposition, series 1898..... 179, 180

- Postage stamps—Continued**
- | | |
|---|--------------|
| Committee French | Page 147 |
| Contracts for printing | 62 |
| Cost of manufacture | 65 |
| Cuban | 66, 67 |
| Curling of sheets | 83 |
| Design, national competition | 132 |
| Dry printing of | 172 |
| First U.S. | 60 |
| First Bureau-printed | 64 |
| 400-subject plates | 83 |
| Guam | 66, 67 |
| Gumming | 64, 168 |
| Imperforate sheets | 68 |
| Legislative authority for printing | 61-63 |
| Military | 147, 153 |
| Multicolor | 131, 179-181 |
| Offset printing of | 97-98 |
| Ordinary: | |
| 8-cent, series 1954 | 173, 176 |
| 5-cent, series 1847 | 60 |
| 4-cent, series 1894 | 64 |
| 4-cent, series 1954 | 169 |
| 1-cent, series 1911 | 172 |
| 1-cent, series 1938 | 131 |
| Series 1938 (Presidential series) | 131-133 |
| 6-cent, series 1894 | 64 |
| 10-cent, series 1847 | 60 |
| 3-cent, series 1908 | 172 |
| 3-cent, series 1954 | 176 |
| 2-cent, series 1911 | 83, 172 |
| Overprinted | 66, 67 |
| Cuba | 67 |
| Guam | 67 |
| Philippines | 67 |
| Porto Rico | 67 |
| "Overrun Countries" | 149 |
| Perforating of | 125-128 |
| Philippine | 65-67 |
| Precancelling of | 169 |
| Presidential series | 131-133 |
| Supplemental Austrian | 147 |
| Supplemental French | 147 |
| 280-subject plates | 134 |
| "Postage Stamp Design" | 179 |
| Postal rate increase | 97, 169 |
| Postal savings bonds | 141 |
| Postal savings certificates | 99, 141 |
| Postal savings stamps | 140-141 |
| Postal savings system, U.S. | 140-141 |
| Postal system, U.S. | 60 |
| Postmaster General | 9, |
| 61, 62, 63, 64, 65, 79, 81, 97, 169 | |
| Farley, James A. | 120, 134 |
| Third Assistant | 61, |
| 63, 68, 69, 79, 80, 81, 179 | |
| Potomac Park (<i>see also</i> East Potomac Park) | 48, 103 |
| Potomac River | 42 |
| Power plate printing presses. <i>See</i> Machinery. | |
| Presidential series, postage stamps | 131-133 |
- Presidents, U.S.:**
- | | |
|-----------------------------------|---------------|
| Cleveland, Grover | 8, 55, 133 |
| Coolidge, Calvin | 105 |
| Eisenhower, Dwight D. | 177 |
| Garfield, James A. | 17, 112, 156 |
| Grant, Ulysses S. | 13 |
| Harding, Warren G. | 104, 105 |
| Hayes, Rutherford B. | 41 |
| Hoover, Herbert | 132 |
| Lincoln, Abraham | 1, |
| 2, 8, 9, 14, 112, 176 | |
| Roosevelt, Franklin Delano | 118, |
| 120, 121, 122, 123, 129, 131, 132 | |
| Taft, William Howard | 110, 132 |
| Taylor, Zachary | 61 |
| Washington, George | 15 |
| 60, 112, 131, 132 | |
| Wilson, Woodrow | 100, 104, 120 |
- Presses. *See* Machinery.
- "Prince," sale of 102
- Printer's assistants 162, 163
- Printing:
- | | |
|---------------------------|-----------------------------------|
| Copperplate | xii, xiii, xiv, xv |
| Dry | 18-20, 39, 109, 156, 172-176, 177 |
| Gravure | xi, 180 |
| Hydrostatic | 18-20, 115, 130, 172 |
| Lithographic | xi, |
| 95-97, 124, 144, 146, 180 | |
| Offset | 30, 93, 95-97, 99, 118 |
| Typographic | xi, xiv, 30, 95, 180 |
| Wet | 172, 173, 175 |
- Printing Division (Bureau title) 22
- Private banknote companies 1, 3, 5,
- 17, 22, 23, 28, 57, 60, 62, 65, 125, 170
- Procurement Division (Treasury Department) 128, 129, 132
- Production comparison, World Wars I and II 138
- Production and delivery statistics 13,
- 20, 24, 28, 29, 34, 46, 61, 62, 64, 66,
- 71-78, 96, 102, 109, 120, 127, 136,
- 139, 141, 145, 148, 150, 163, 167, 176
- Propagating Gardens 88
- Proprietary stamps 27, 29, 57
- Provincial Congress of Massachusetts xiii
- Provisional Government of the French Republic 144
- Prud'homme, John F. E. 7
- Public Debt, Bureau of. *See* Treasury Department.
- Public Debt, Commissioner of (Treasury Department) 78, 128
- Q**
- Quartermaster depots 147
- R**
- "R" and "S" notes 149-150
- Ralph, Howard F. 89
- Ralph, Joseph E. 89
- Rawlinson, Elaine 132

- | | Page | | Page |
|---|---|---|---|
| Rectified spirits stamps | 29 | Separating currency notes | 72, 73 |
| Reductions in force | 103, 121, 178 | Serbia | 90 |
| Register of the Treasury | 2, 104 | Serial numbers | 114, 121, 164 |
| Rembrandt | xii | Sheet beer stamps | 71 |
| Remington, Frederic | 181 | Sheet cigar stamps | 71 |
| Research and development program | 130-131 | Sheet tobacco stamps | 71 |
| Revere, Paul | xiii | Shepard, Alan | 181 |
| Revolutionary War | 140 | Sherman, John, Secretary of the Treasury | 32, 54, 58 |
| Robbery, 1954 | 169-172 | Sherman, Gen. William T. | 9, 13 |
| Roosevelt, Franklin Delano | 118, 120, 121, 122, 123, 129, 131, 132 | Shinplaster | 9 |
| Root, Elihu, Secretary of War | 66 | Shortages | 166-167 |
| Rose, George U. | 108 | Siamese currency | 124 |
| Royalties | 32, 35 | Siamese Government, Royal | 124 |
| Rule Book, 1880 | 49-51 | Sicily | 143, 145 |
| Russian Ambassador | 154 | Siderography | xvi, 108 |
| Russian Embassy | 154 | Signatures, overprinting of | 3, 121, 163-164 |
| Russian Government | 153-155 | Signing of notes | 2 |
| Russian plates | 153-155 | Silk fibers, distinctive paper | 37-39, 114, 130 |
| | | Silver certificates | 72, 102, 107, 110, 114, 121, 142, 143, 150, 163, 164, 176 |
| S | | Sizing operation | 130 |
| St. Clair, Labert | 95 | Skinner, Thomas E. | 102 |
| Savings | 71-75, 96, 157, 163 | Small Note Bureau | 21 |
| Savings stamps | 140-141 | Small Note Department | 21 |
| Scanning device | 169 | Small Note Room | 21 |
| Scouts, Boy and Girl | 139 | Small-sized currency notes | 17, 38, 66, 110, 114, 115, 130, 157, 159 |
| Seal, Great, of the United States | 121-123 | Smithsonian Institution | 43 |
| Seal, Treasury | 2, 58, 59, 72, 114, 142, 143, 164 | Snuff stamps | 29, 107 |
| Sealey, Alfred | 7 | Southwest Wharves | 48 |
| Sealing of currency | 2-5, 57-59, 72-73, 121 | Soviet Government | 153-155 |
| Secret Service, U.S. | 78, 81, 110, 129, 146, 170, 171 | Soviet Union, U.S. Ambassador to | 153 |
| Secretary of State | 153 | Spanish-American War | 29, 48, 65, 84, 85, 179 |
| Secretary of the Treasury | 1, 2, 24, 29, 37, 38, 39, 40, 43, 50, 53, 54, 62, 63, 66, 73, 78, 81, 95, 100, 108, 121, 151, 164, 166, 176, 177. | Speical Deposit Account No. 29 | 166-167 |
| Boutwell, George S. | 37 | Special tax stamps | 27, 28, 29, 107 |
| Chase, Salmon P. | 1, 3, 4, 5, 9, 16, 19, 20, 22, 35, 36 | Spencer, Asa | xvi, xvii |
| Folger, Charles J. | 32 | Spider-leg paper | 36, 37 |
| Glass, Carter | 93 | Spinner, Francis E. | 12, 16, 118 |
| MacVeagh, Franklin | 110, 111 | Stable division | 102 |
| McAdoo, William G. | 111 | Stamp affixing and vending machines | 67, 79 |
| Mellon, Andrew W. | 56, 111, 112 | Stamp book covers | 97 |
| Morgenthau, Henry, Jr. | 120, 123 | Stamps: | |
| Sherman, John | 32, 54, 58 | Cotton order | 134, 135 |
| Secretary of War, Elihu Root | 66 | Food order | 134-136 |
| Securities | 5, 17, 23, 34, 35, 75, 90, 156, 165, 167 | Internal revenue. <i>See</i> Internal revenue stamps. | |
| Copperplate printing of | xiii | Postage. <i>See</i> Postage stamps. | |
| Loss of sheets | 166-167 | War savings | 92, 141 |
| Protection of | 62 | State Department (<i>see also</i> Secretary of) | 91, 124, 144, 154 |
| War-financing | 27, 92-95, 98, 137, 138 | Statue of Liberty | 173 |
| Senate. <i>See</i> Committees: Congressional. | | Stecher-Traung Lithograph Corp. | 146 |
| Senators, U.S.: | | Steel engraving | xi, xvii |
| Morrill, Justin L. | 43 | Stereotype check points | xiv |
| Senefelder, Johann | 95 | Stereotype plates | xvi, 95 |
| | | Stickney, Benjamin F. (<i>see also</i> Presses) | 79, 80, 83 |

	Page
"Strike through"-----	18
Strip cigar stamps-----	71
Stuart, Gilbert Charles-----	133
Stub tobacco stamps-----	71
Studebaker Brothers Co-----	102
Subtreasuries-----	78
Sullivan, Thomas J-----	49, 57
Supplemental Austrian postage stamps-----	147
Supplemental French postage stamps-----	147
Supply problems-----	90-92

T

Taft, William Howard-----	110, 132
Tax paid stamps-----	27
Taylor, Zachary-----	61
Technological improvements-----	70, 157, 178
Telephones-----	50
Tobacco stamps-----	28, 34
Tokyo-----	142
Tolentino, Guillermo E-----	67
Transfer of designs-----	xvi
Transportation requests, U.S-----	102
Treasurer of the United States-----	2, 4, 12, 16, 40, 58, 59, 72, 73, 77, 78, 102, 110, 118, 119, 121, 148, 149, 164, 166
Treasury building-----	2, 5, 6, 7, 13, 16, 23, 41, 78, 87
Treasury Department-----	2, 3, 5, 13, 14, 16, 17, 18, 19, 22, 23, 24, 32, 36, 38, 39, 40, 41, 43, 46, 50, 54, 64, 72, 78, 88, 115, 118, 119, 120, 122, 123, 124, 128, 138, 140, 141, 142, 156, 165, 177.
Assistant Secretary-----	79, 81, 109, 128
Coast Guard-----	146
Comptroller, First or Second-----	2
Comptroller of the Currency-----	21, 22, 23, 81
Construction, Bureau of-----	2, 3
General Counsel-----	167
Internal Revenue Service-----	27, 29
Loan Branch-----	2, 3
Loans and Currency, Division of-----	110
Mint, Bureau of-----	43, 122, 124, 132
Procurement Division-----	128, 129, 132
Public Debt, Bureau of-----	78, 128, 139, 150
Register of the Treasury-----	2, 104
Secret Service, U.S-----	78, 81, 110, 129, 146, 170, 171
Subtreasuries-----	78
Supervising Architect-----	43, 45
Treasurer. See Treasurer of the United States.	
Under Secretary-----	145, 154
See also Secretary of the.	
Treasury notes-----	3, 4, 5, 13, 21, 107, 165
Treasury Seal-----	2, 58, 59, 72, 114, 142, 143, 164
Tunisia-----	143
Typographic printing-----	xi, xiv, 30, 95, 180

U

	Page
Uniform back design, currency notes-----	111, 114
Unions-----	34, 35, 95, 108
Universal Telegraphic Co-----	80
United States Code citations-----	36, 39
U.S. notes-----	5, 37, 38, 58, 72, 107, 110, 114
USS <i>Missouri</i> -----	151

V

Vasari-----	xii
Vehicles-----	101, 102
Vending machines, stamp-----	67, 79
Veterans Bonus Bill-----	120
Vienna exhibition-----	24, 26
Virginia State Police-----	171

W

Walter Reed Army Hospital-----	101
War Department-----	16, 65, 66, 88, 124, 137, 143, 144, 146, 147, 148, 153
War-financing measures-----	27, 92-95, 98, 137, 138
War of Independence-----	140
War savings certificates-----	92
War savings stamps-----	92, 141
Washington, D.C-----	22, 41, 42, 43, 44, 48, 90, 91, 94, 101, 151, 152, 164
Washington, George-----	10, 15, 60, 112, 131, 132
Washington, Martha-----	133
Washington Monument-----	47, 48, 88
Washington Navy Yard-----	48
Washington <i>Post</i> -----	94
Washington <i>Star</i> -----	106
Watchmen-----	50, 55
Wet printing-----	172, 173, 175
Whiskey stamps-----	107
White House-----	120, 133
Whitney, Eli-----	133
Wholesale liquor dealer stamps-----	71
Willcox, Messrs. J. M., & Co-----	37
Wilmoth, James L-----	104, 105
Wilson, Woodrow-----	100, 104, 120
Wine stamps-----	29
Women employees-----	3, 16, 53, 137
Woodin, Lucy-----	56
Workspace-----	46, 84, 98-99, 137
World War I-----	29, 38, 77, 90, 95, 97, 98, 99, 100, 102, 103, 106, 108, 137, 138, 139, 152, 172, 185
World War II-----	39, 70, 96, 117, 130, 137, 138, 141, 152, 153, 157, 164, 167, 178, 180, 185
World's Columbian Exposition-----	24
Wrapper, coil postage stamps-----	70
Wright, Andrew S-----	56

Y

Yellow seal currency-----	143
Yen currency-----	146
Yugoslavia-----	149

